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USDA Foreign Agricultural Service

## Pakistan: Crop Progress Report

MY 2010/11

### March Summary

March 31, 2010

(1) The current outlook for national wheat production in MY 2010/11 is below average, given generally poor winter rainfall in northern Pakistan and insufficient irrigation supplies in Punjab province. In particular, Pakistan's major rainfed wheat growing areas (especially in northern Punjab) suffered from drought, while irrigated wheat crops over large areas in Punjab also displayed less favorable development than last year and the long-term (6-year) average. Moisture conditions substantially improved during the past 4-5 weeks, as strong weather fronts brought beneficial moisture to northern Pakistan. However, these rains apparently came too late to fully offset earlier drought-related development problems, with crops never achieving the same vigor or density as last year. Total national wheat production is expected to fall below actual domestic demand this year; likely resulting in a drawdown of government wheat stocks and limiting the export capacity to neighboring countries like Afghanistan. Wheat crops have already passed peak reproductive growth phases in Punjab province, and are now at harvest stage in Sindh. The Government of Pakistan has reported that planted national wheat area was very similar to last year's record level of over 9.0 million hectares. Satellite imagery indicates that harvested wheat area will actually be lower than last year, owing to substantial crop losses in the Barani rainfed agricultural lands. Normally, there are estimated to be over 1.1 million hectares of rainfed wheat crops in northern Punjab, the Northwest Frontier Province, and F.A.T.A. combined. It is expected that much of this land will not produce a harvestable crop this year.

(2) Below normal rainfall conditions persisted over the majority of wheat growing areas in Pakistan for most of the MY 2010/11 growing season, resulting in considerable crop stress. A favorable change in the weather pattern occurred, however, late in the season (mid-February through mid-March) when storm fronts brought copious rainfall to parched portions of northern Pakistan's grain regions. These rains occurred during critical late-reproductive growth phases, and likely benefitted Punjab's production potential. Season-to-date cumulative precipitation, as a result, rose to near-normal levels in Punjab (Figure 1-4). Total seasonal rainfall between October 1, 2009 and March 20, 2010 averaged 150-250 mm in the rainfed (Barani) areas of Northern Punjab and N.W.F.P, but virtually all of this occurred in the past 30 days, well after the crop had been decimated by drought and too late to help substantially boost wheat production. High daytime temperature conditions also quickly depleted soil moisture supplies in this region, preventing a significant recovery in crop production potential (Figure 5-6). As a result it is expected that MY 2010/11 rainfed wheat production will fall to the lowest level in the past 10 years. Recent remote sensing data confirmed considerably reduced crop density this season in the major rainfed wheat growing regions of Northern Punjab and N.W.F.P. At the same time irrigated cropland in Punjab

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appeared to benefit from the late season rainfall and increased irrigation supplies in late February, with visible crop improvement (Figures 7, 9-10).

(3) Analysis of satellite-derived vegetation index (NDVI) data in early March, with values aggregated over entire districts, revealed that inadequate rainfall and irrigation supplies led to very mixed wheat growing conditions and crop yield potential throughout the country (Figure 7). While crops in major producing areas in northern Punjab and N.W.F.P. suffered significant declines compared to last year and average, other districts in southern Punjab and Sindh actually show higher production potential. It is apparent from evaluating NDVI data during peak wheat development phases (Mid-February to early March) that irrigated wheat growing districts in central Punjab benefitted from late season rainfall, with a burst of growth in early March (Figures 8, 10). The NDVI data also illustrate the stark differences in crop development between purely non-irrigated rainfed croplands and irrigated croplands in Punjab this year (Figures 8-9). In general, despite beneficial late season rainfall, the multi-year NDVI analysis indicates that wheat crop yield potential is lower than last year and lower than the 6-year average (Figures 12-18). In the rainfed Barani growing areas, wheat crop potential is worse than any of the past 10 years (Figures 8, 14).

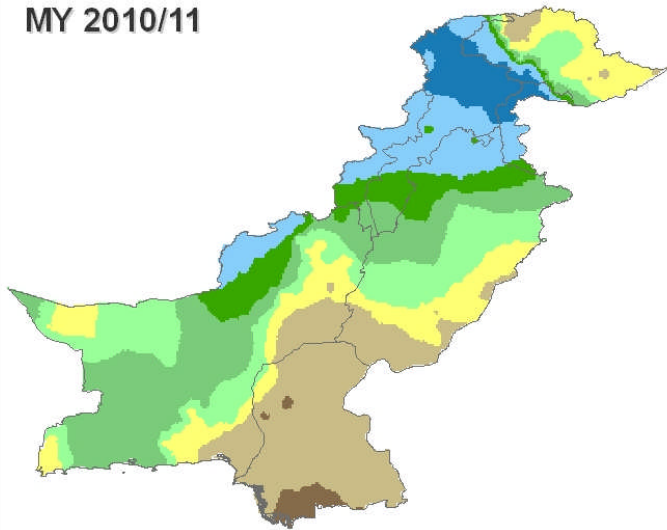
(4) Medium resolution satellite imagery (Landsat 30x30 m, AWiFS 56x56 m) over Pakistan during February and March, 2010, indicated that timely irrigation, where available, supported vigorous crop development (Figures 19-20, 22-24). Surface water resources behind major dams like Tarbela were used extensively during late February and early March (Figure 21). Healthy irrigated crops appeared on mid-March imagery both in 2009 and 2010, as Tarbela reservoir levels rapidly declined to half of its start-of-the-season capacity. Following heavy February rainfall the Jhelum River also showed signs of increased flow along its watercourse (Figure 23). While irrigated crops in Sindh progressed nicely during their peak development growth phases, a shortage of water appeared in Lower Sindh where signs of depleted stream flow were evident along much of the Lower Indus River. This depleted stream flow indicated generally intensive irrigation consumption (Figure 24).

(5) The NOAA Climate Prediction Center's 7-day rainfall forecast for Pakistan indicates that no rainfall is expected over the majority of the agricultural plains during the next week. Up to 75 mm of precipitation is forecast in the mountain areas of northern Pakistan. These rains will be important for replenishing water resources for the next kharif or summer irrigation season, but won't improve the production outlook of the current rabi or winter grain season (Figure 25)

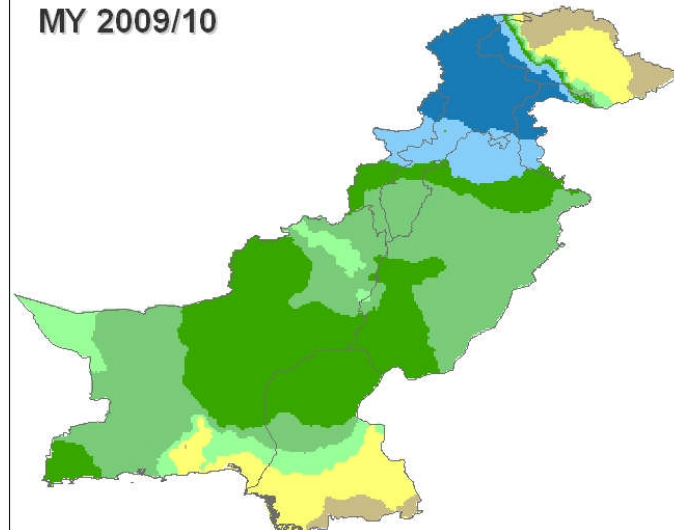
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Cumulative Precipitation, Current and Previous Grains Seasons, October 1 - March 20

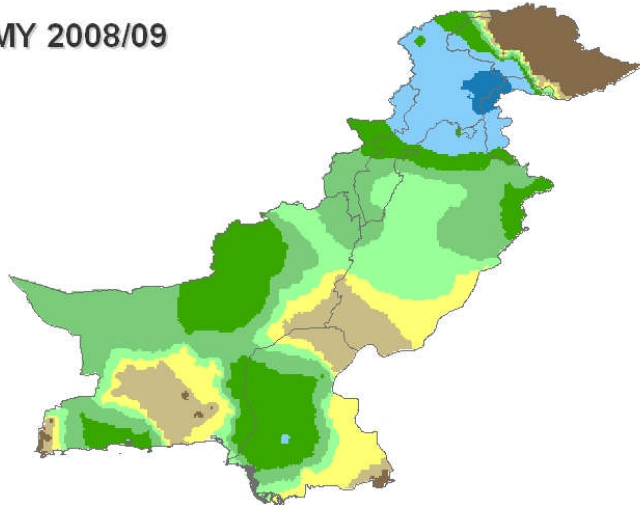
MY 2010/11



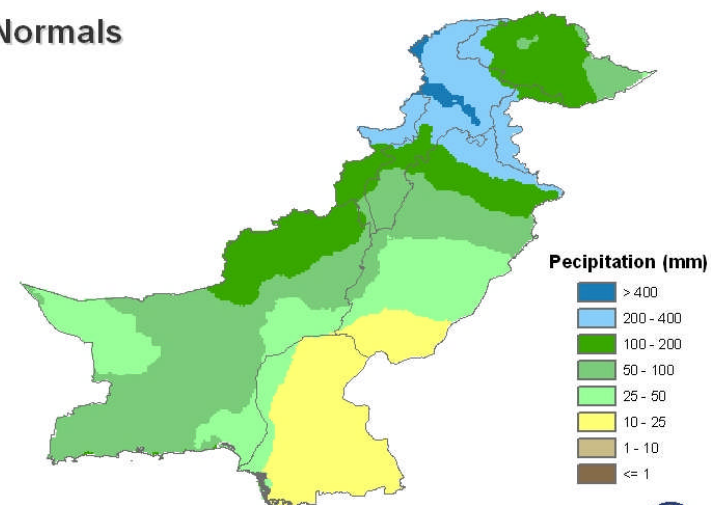
MY 2009/10



MY 2008/09



Normals



Data Source: USDA/FAS,  
Office of Global Analysis, Crop Explorer



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Figure 1. Season to-date cumulative precipitation norm and seasonal rainfall, October 1 - March 20, 2008-2010. *Data Source: Crop Explorer*

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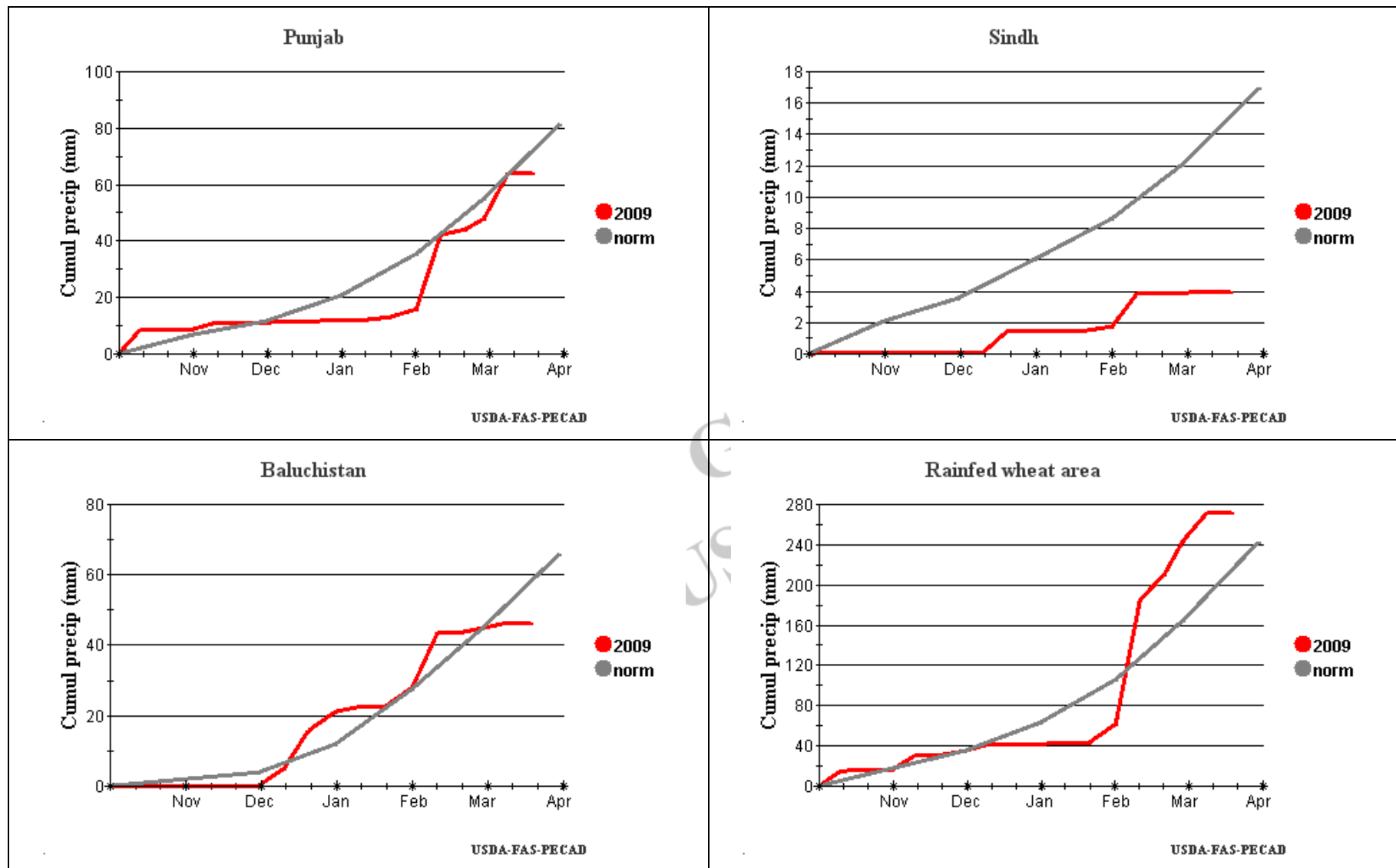
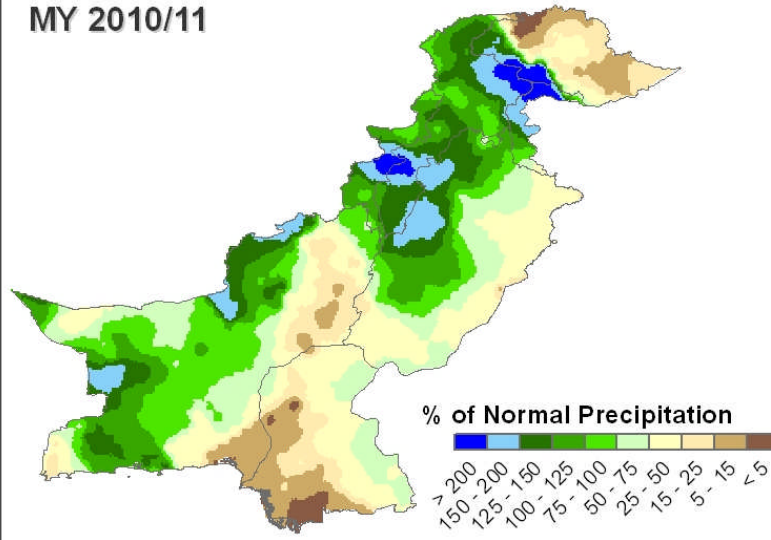


Figure 2. Season to-date regional cumulative precipitation norm and rainfall, October 1 - March 20, 2008-2010. *Data Source: Crop Explorer*

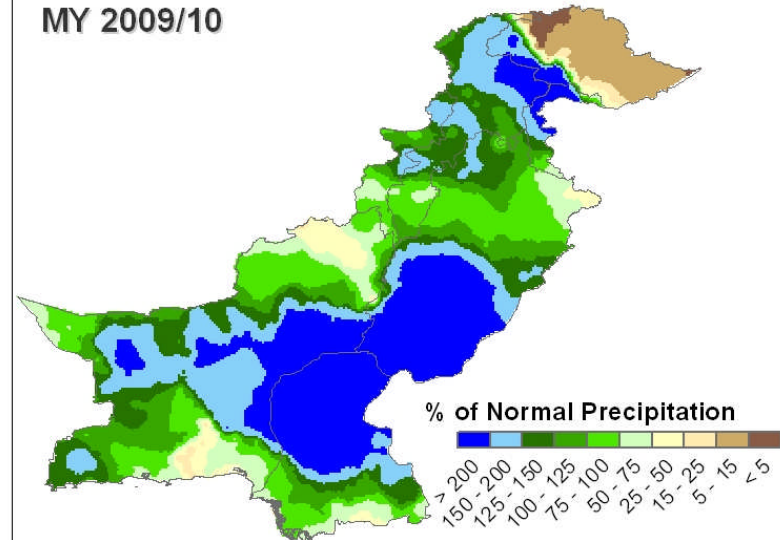
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Percent of Normal Precipitation, Current and Previous Seasons, October 1 - March 20

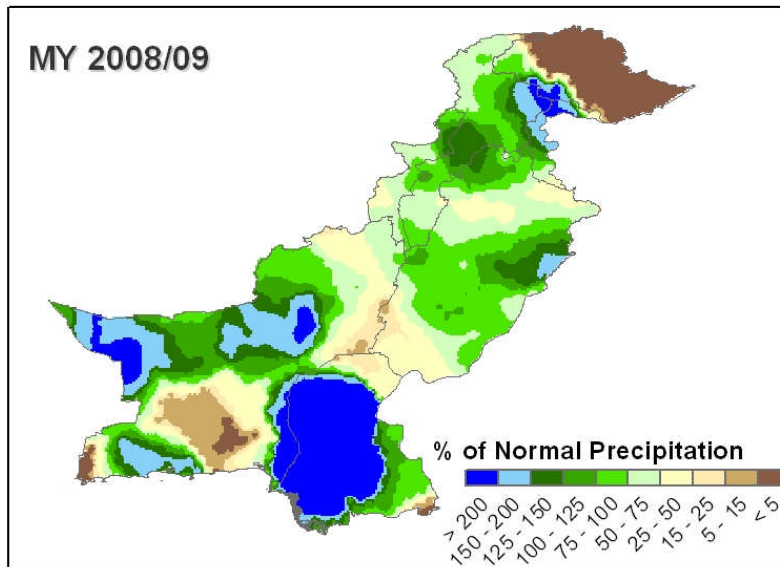
MY 2010/11



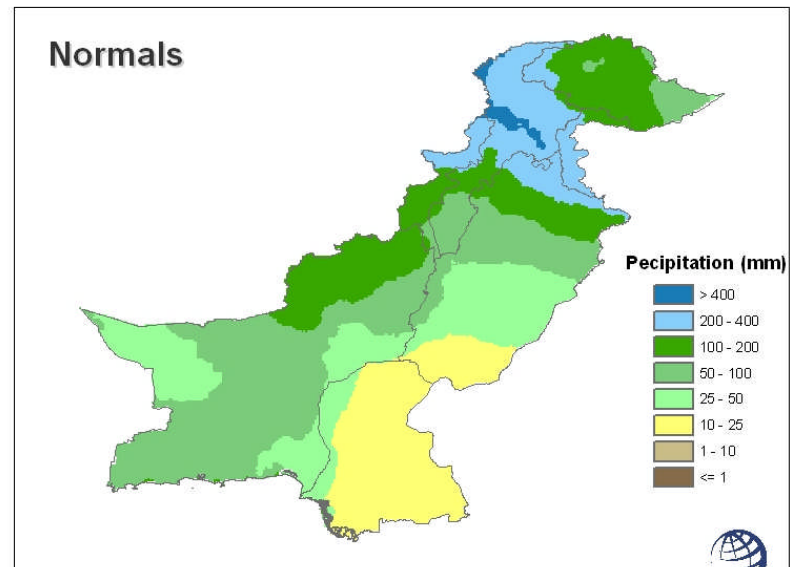
MY 2009/10



MY 2008/09



Normals



Data Source: USDA/FAS,  
Office of Global Analysis, Crop Explorer



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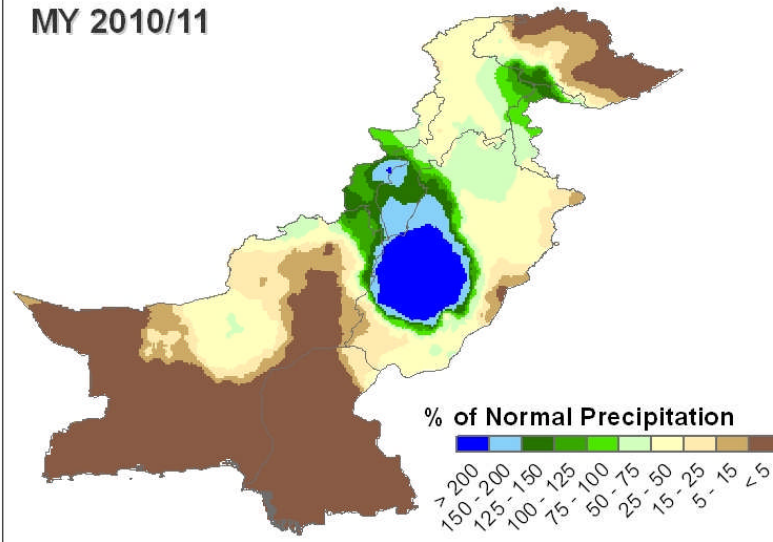
Figure 3. Cumulative precipitation norm and percent of normal rainfall during current and prior two wheat seasons, 2008-2010. *Data Source: Crop Explorer*

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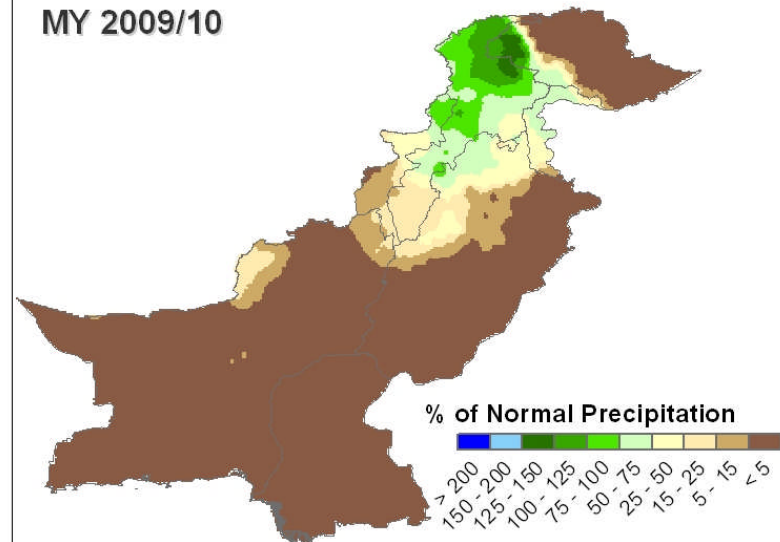
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Percent of Normal Precipitation, Current and Previous Winter Grains Seasons, March 1-20

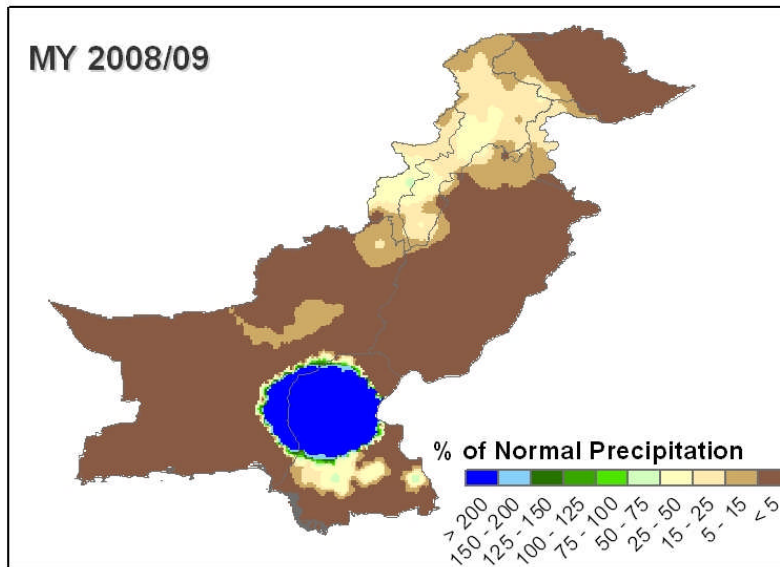
MY 2010/11



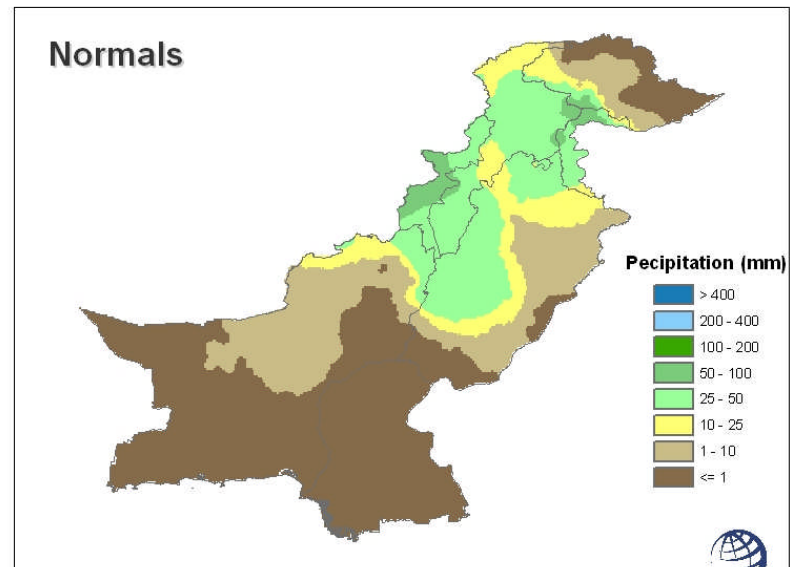
MY 2009/10



MY 2008/09



Normals



Data Source: USDA/FAS,  
Office of Global Analysis, Crop Explorer



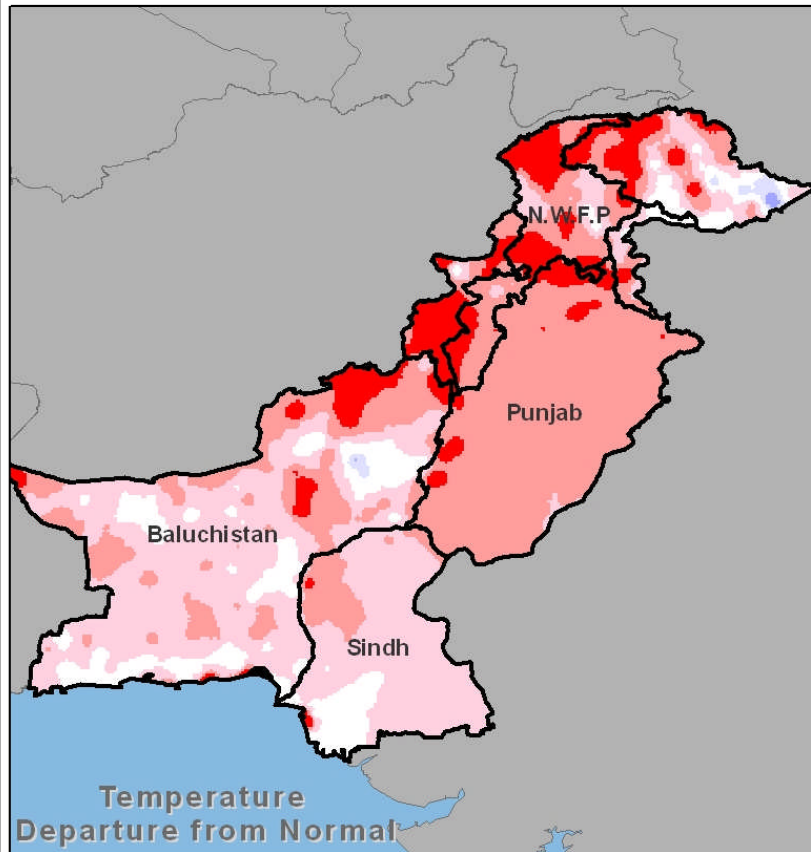
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Figure 4. Cumulative precipitation and percent of normal rainfall, March 1 - 20, 2010. *Data Source: Crop Explorer*

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## T°C departure from Normal and Soil Moisture, February, 2010

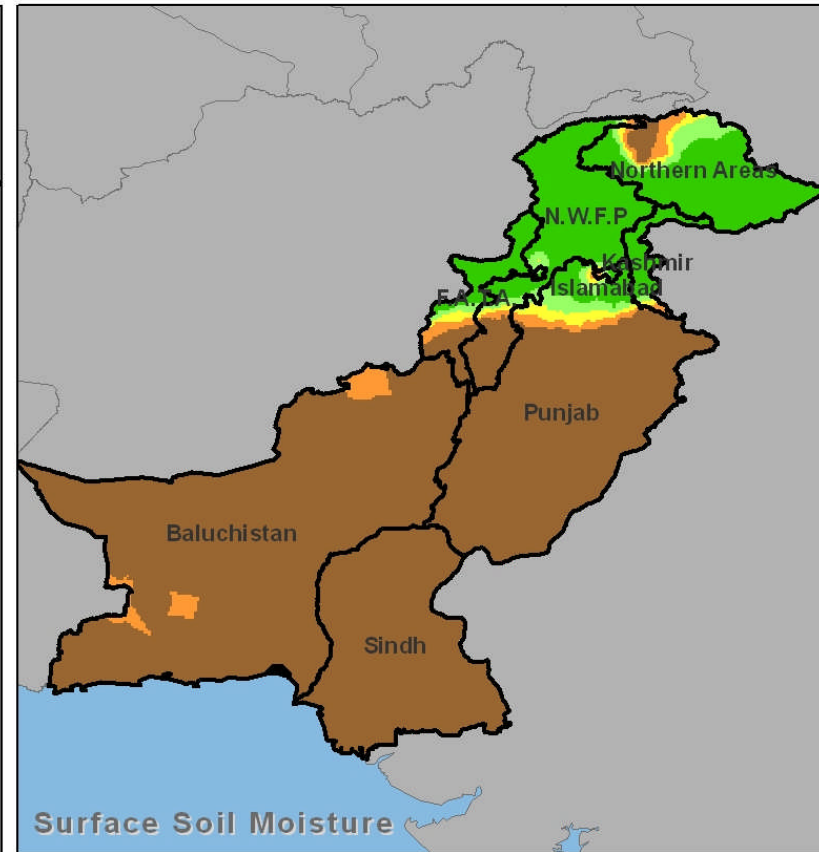


Temperature Departure from Normal (degrees C)

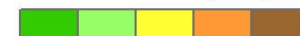


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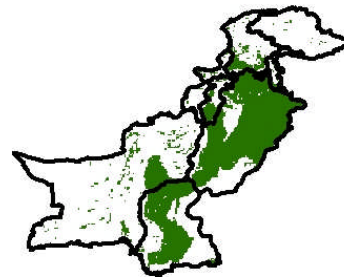
Data Source: USDA-FAS  
Office of Global Analysis- IPAD  
Crop Explorer



Surface Moisture (mm)



20-25 15-20 10-15 5-10 0-5



Location of Agriculture





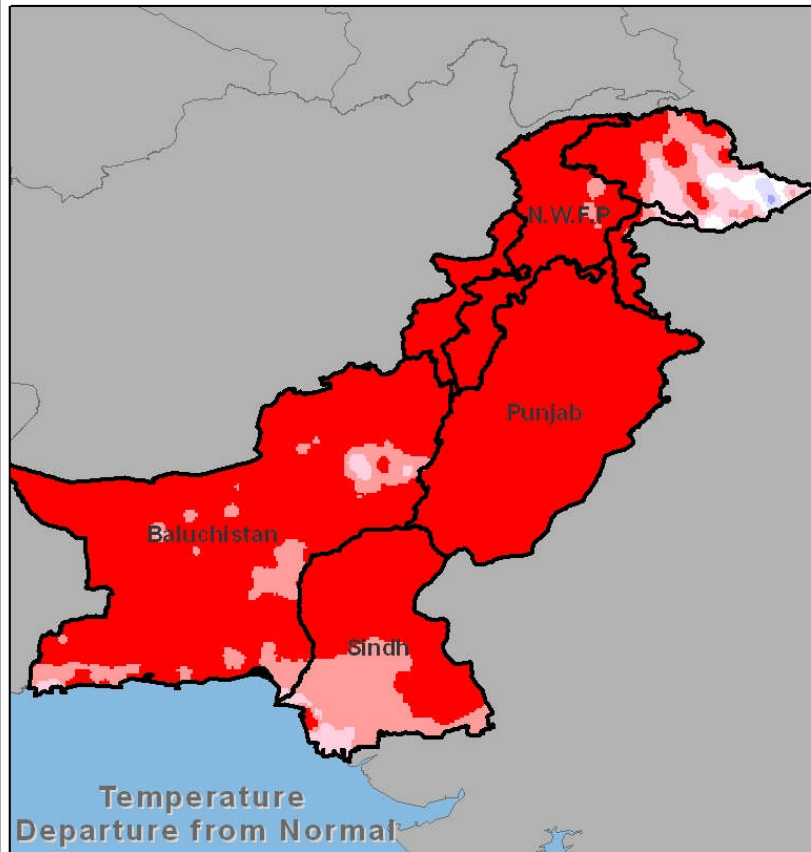
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Figure 5. Temperature departure from normal and surface soil moisture content, February, 2010. *Data Source: Crop Explorer*

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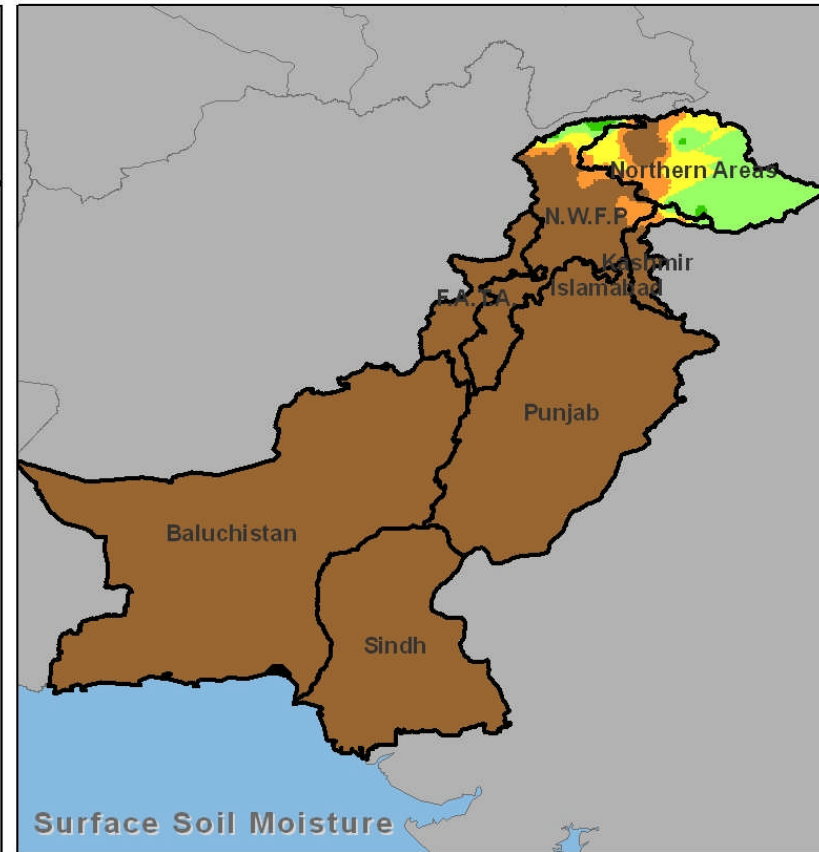
## T°C departure from Normal and Soil Moisture, March 11 - 20, 2010



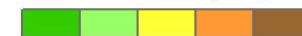
Temperature Departure from Normal (degrees C)



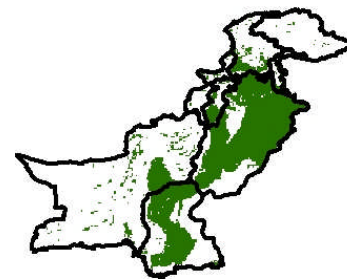
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Surface Moisture (mm)



20-25 15-20 10-15 5-10 0-5



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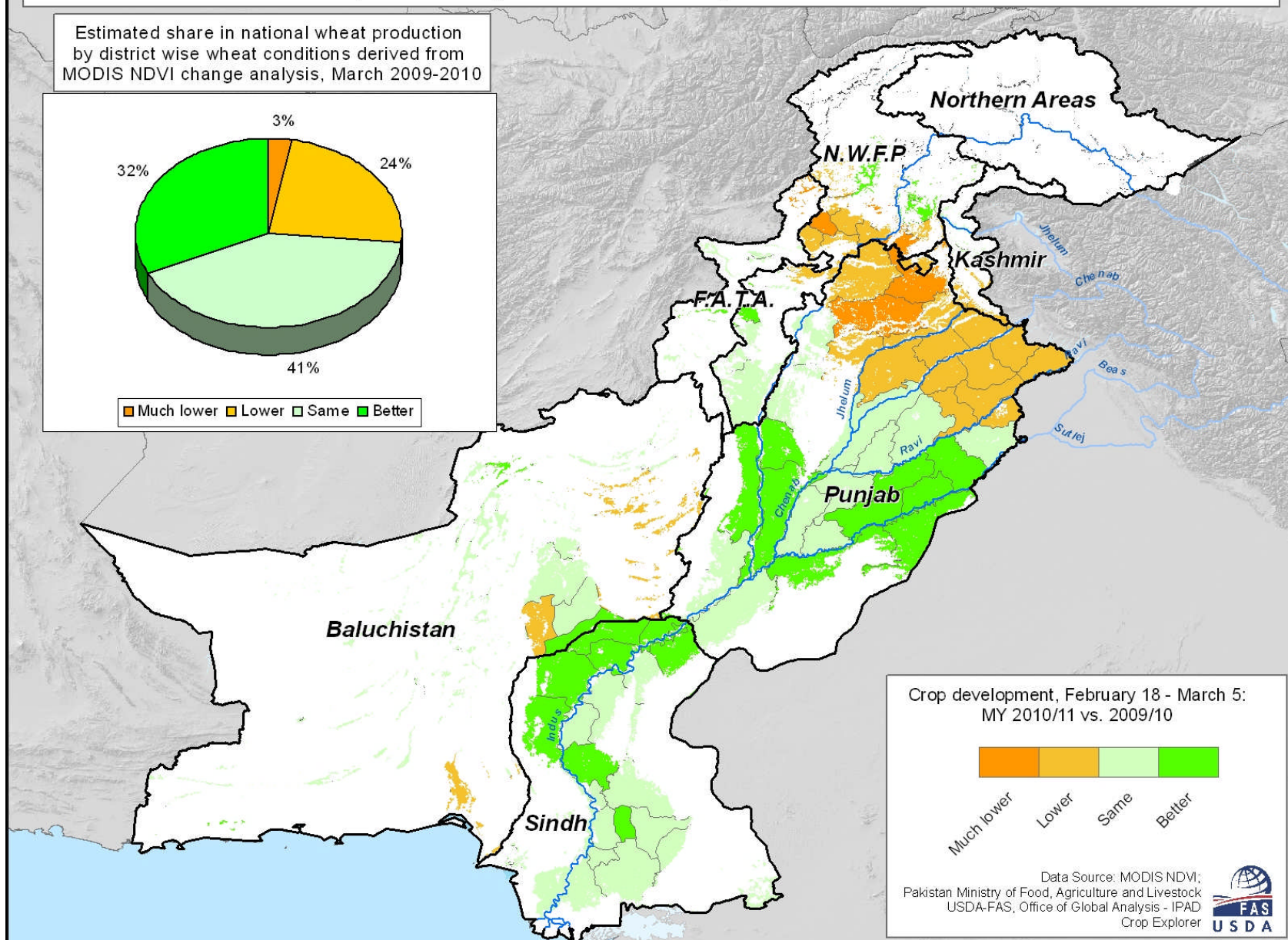
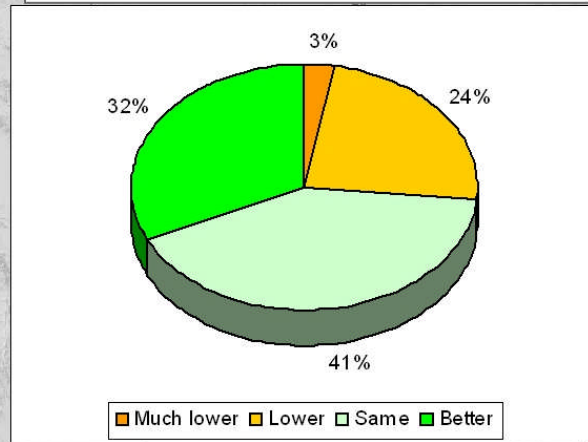
Figure 6. Temperature departure from normal and surface soil moisture content, March 1 - 20, 2010. *Data Source: Crop Explorer*

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## Winter Wheat Status, February 18 - March 5, 2010: MY 2010/11 vs. MY 2009/10

Estimated share in national wheat production by district wise wheat conditions derived from MODIS NDVI change analysis, March 2009-2010



Crop development, February 18 - March 5:  
MY 2010/11 vs. 2009/10



Data Source: MODIS NDVI;  
Pakistan Ministry of Food, Agriculture and Livestock  
USDA-FAS, Office of Global Analysis - IPAD  
Crop Explorer



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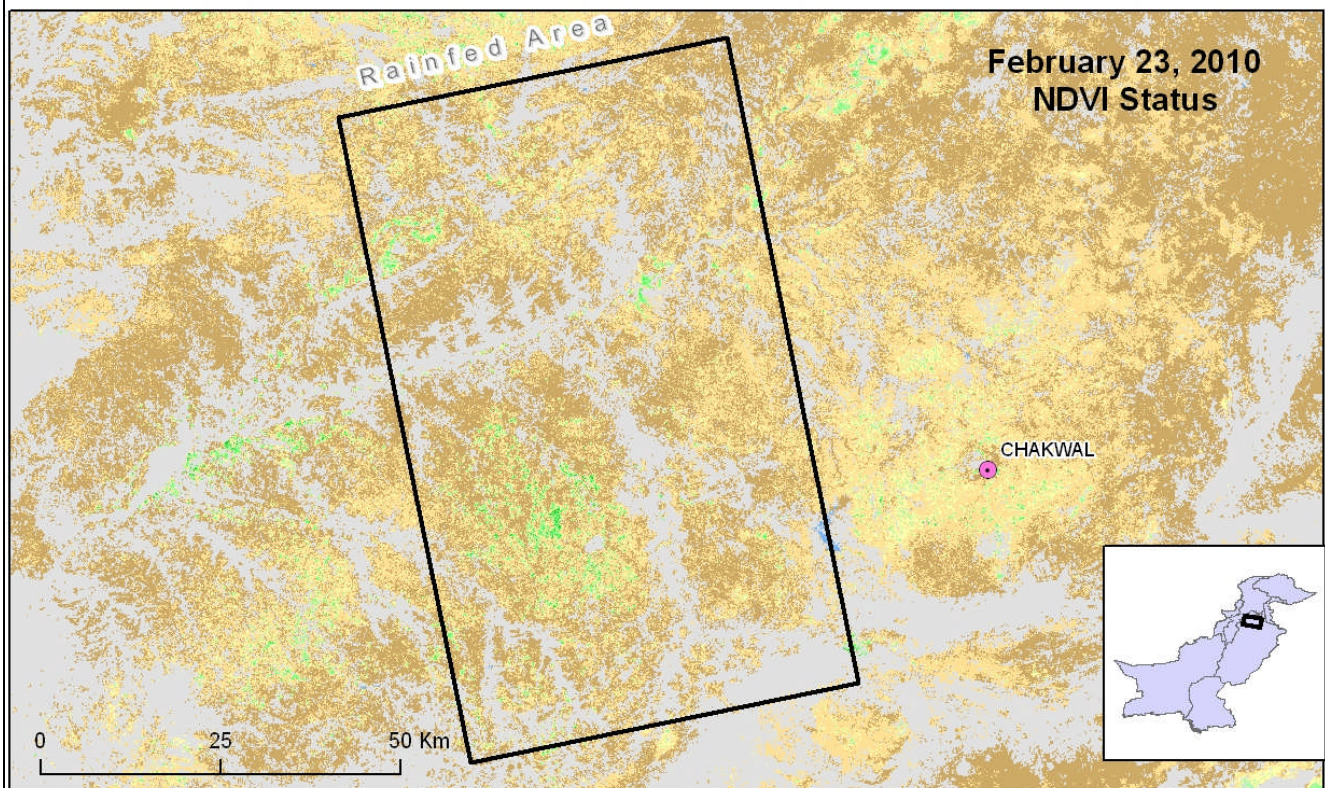
Figure 7. Estimated share in national production by zones delineated based on February – March, 2010 and 2009, wheat conditions. *Data Source: MODIS NDVI*

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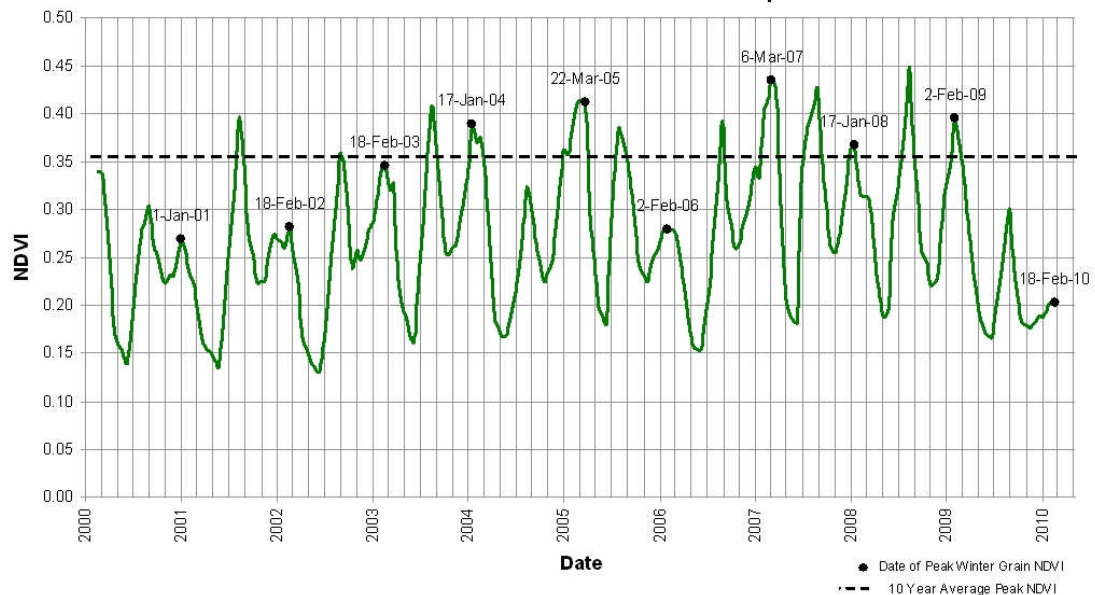


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**Crop Status across Rainfed Wheat Areas, Peak Rabi Season, 2010**



**Rainfed Crop NDVI Time Series, 2000-2010**  
 across the area delineated on the map



**Crop Abundance**



Data Source: AWiFS;  
 Pakistan Ministry of Food, Agriculture and Livestock  
 USDA-FAS, Office of Global Analysis - IPAD  
 Crop Explorer





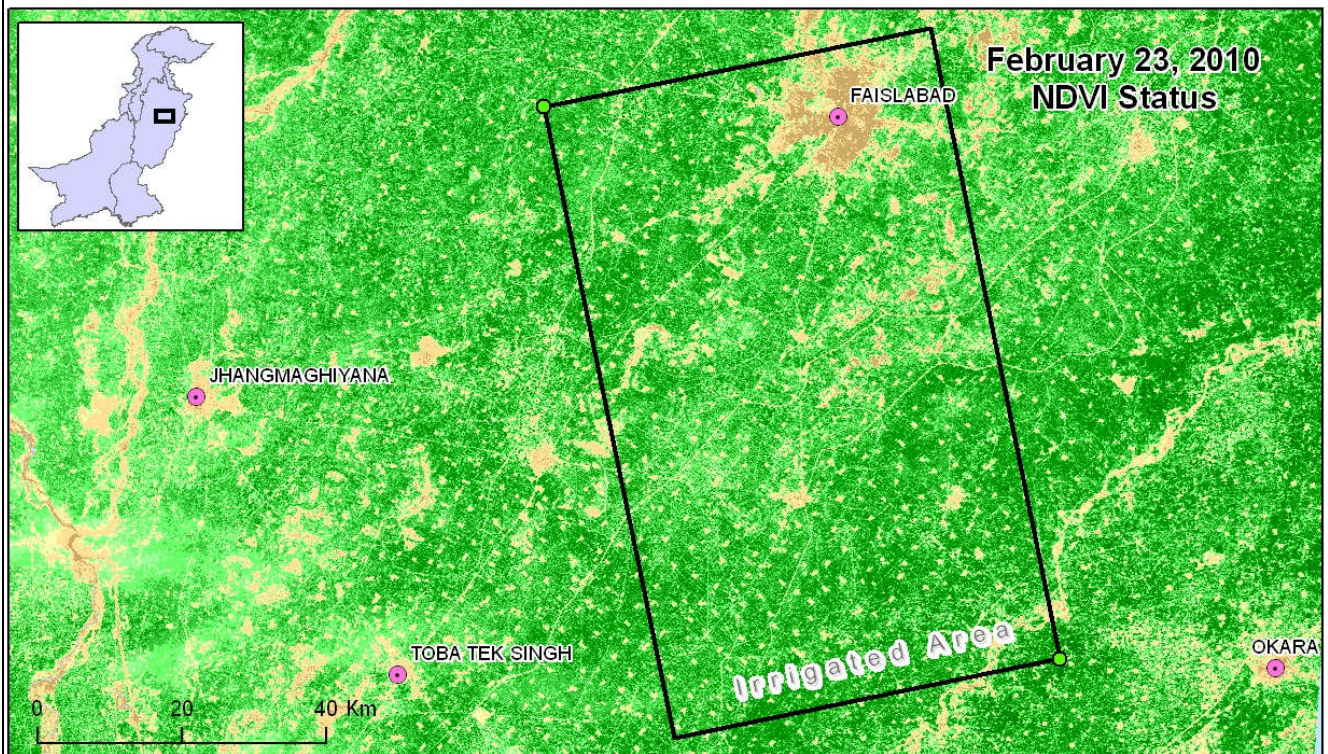
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Figure 8. Crop status in major rainfed wheat area of Northern Punjab, February, 23, 2010. *Data Source: AWiFS, MODIS NDVI*

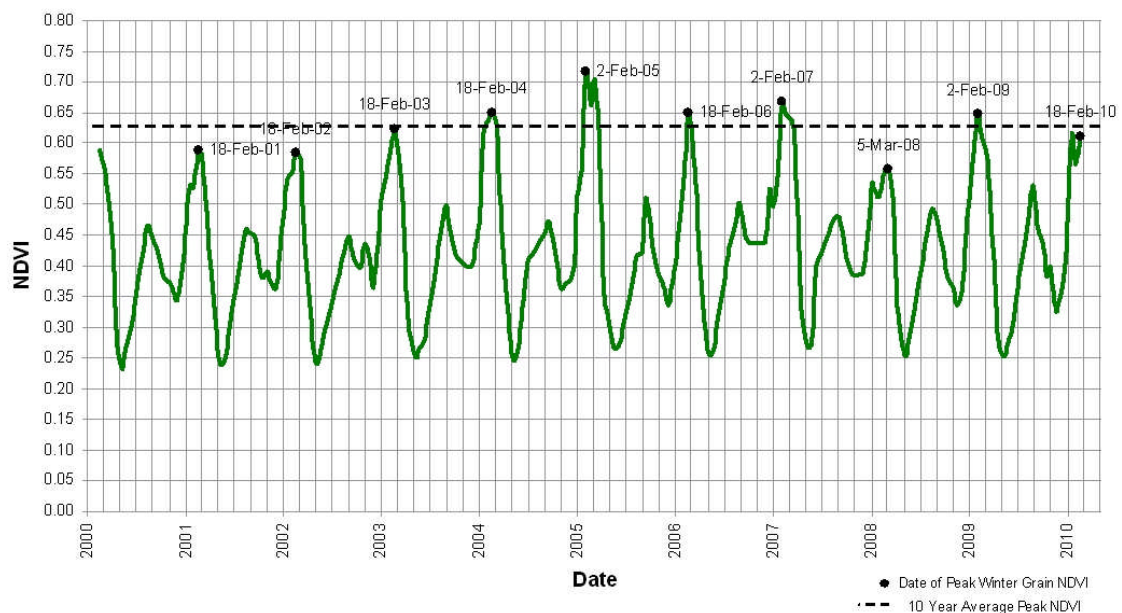
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### Crop Status across Irrigated Wheat Areas, Peak Rabi Season, 2010



### Irrigated Crop NDVI Time Series, 2000-2010



#### Crop Abundance



Data Source: AWiFS;  
Pakistan Ministry of Food, Agriculture and Livestock  
USDA-FAS, Office of Global Analysis - IPAD  
Crop Explorer



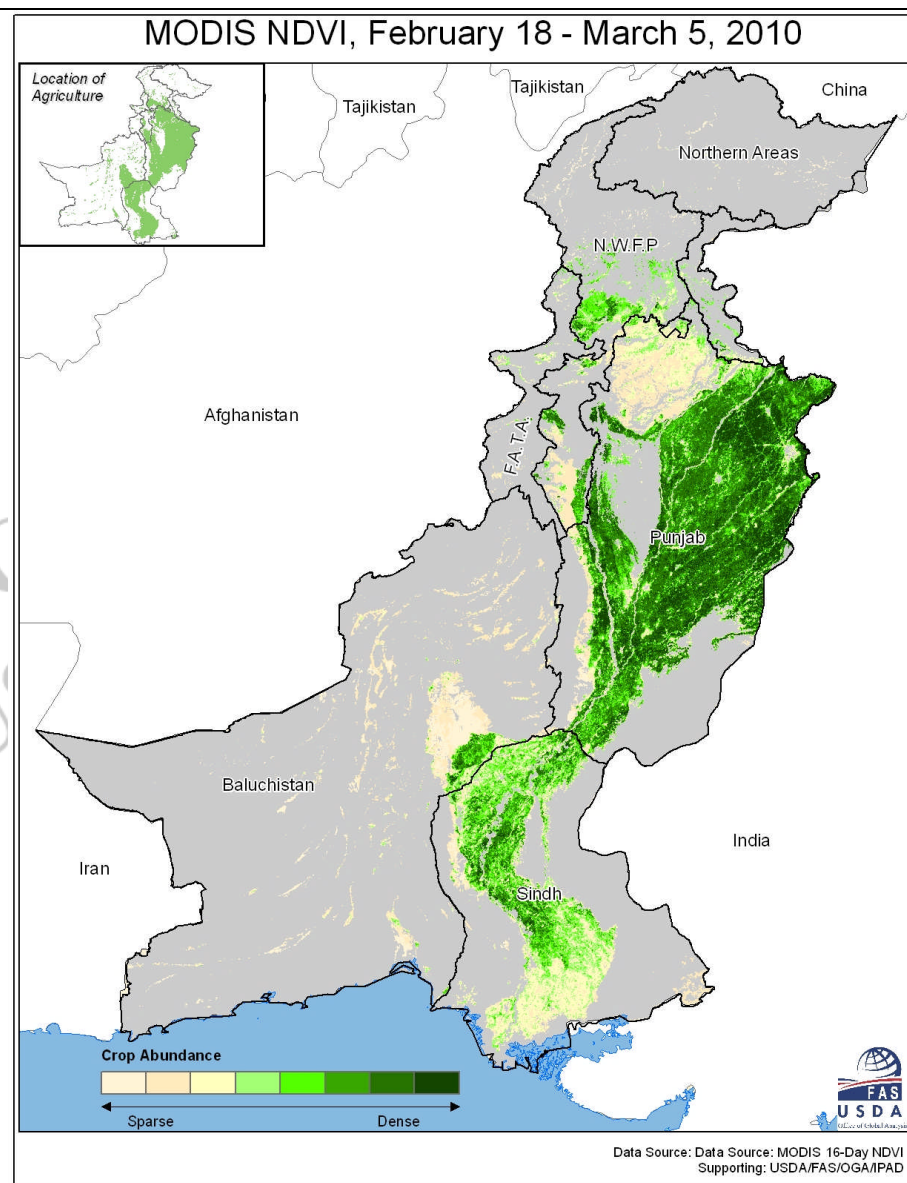
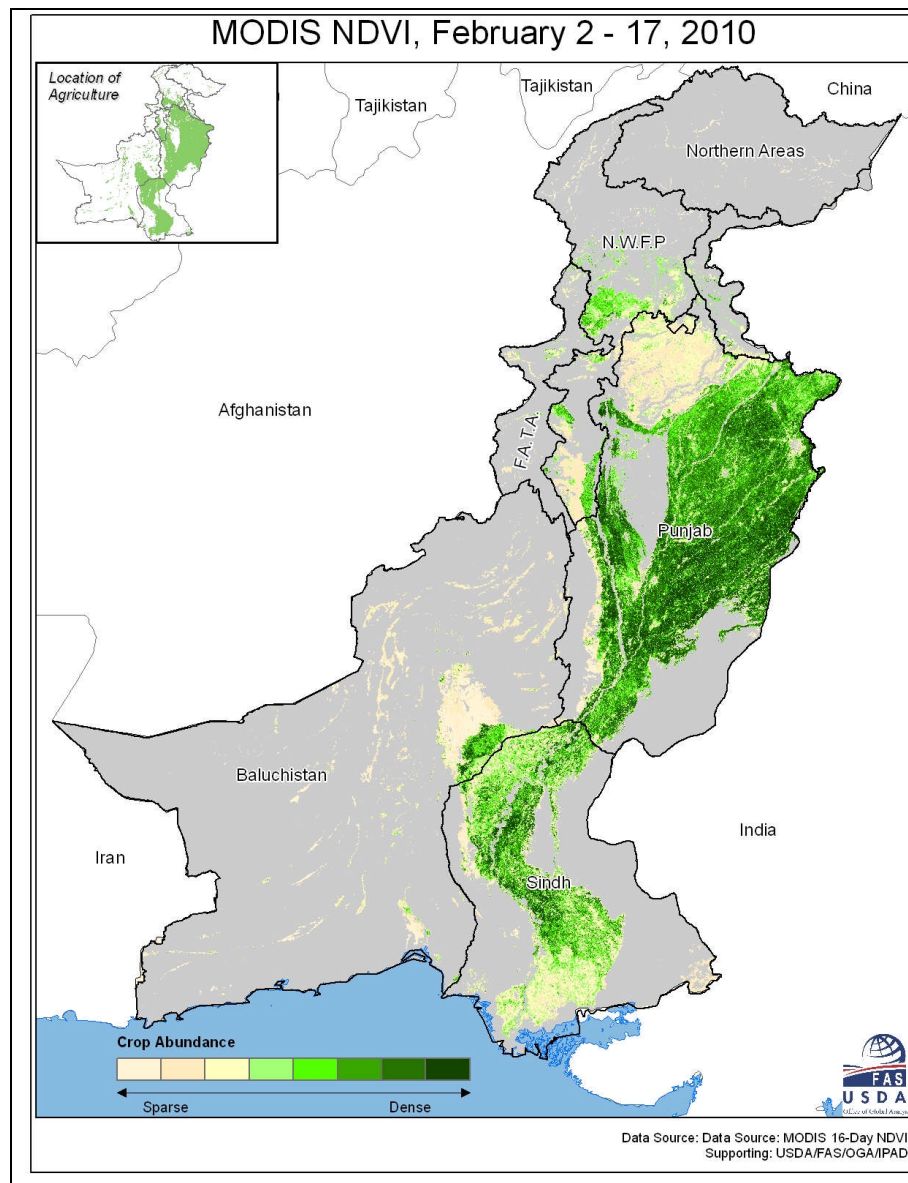
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Figure 9. Crop status in major irrigated wheat area of Central Punjab, February, 23, 2010. *Data Source: AWiFS, MODIS NDVI*

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Figure 10. MODIS NDVI, February - March, 2010. *Data Source: MODIS 16-Day NDVI*

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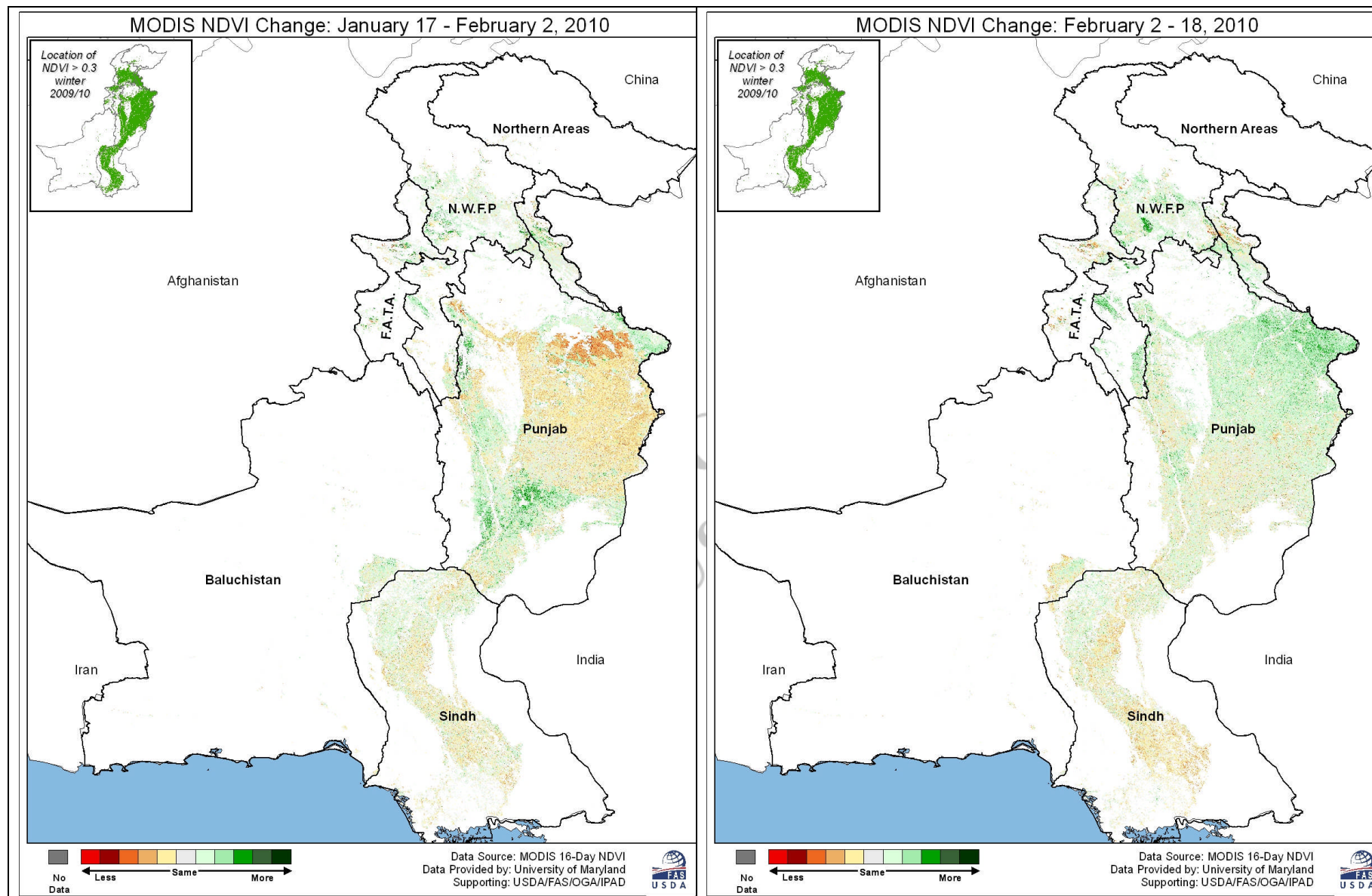
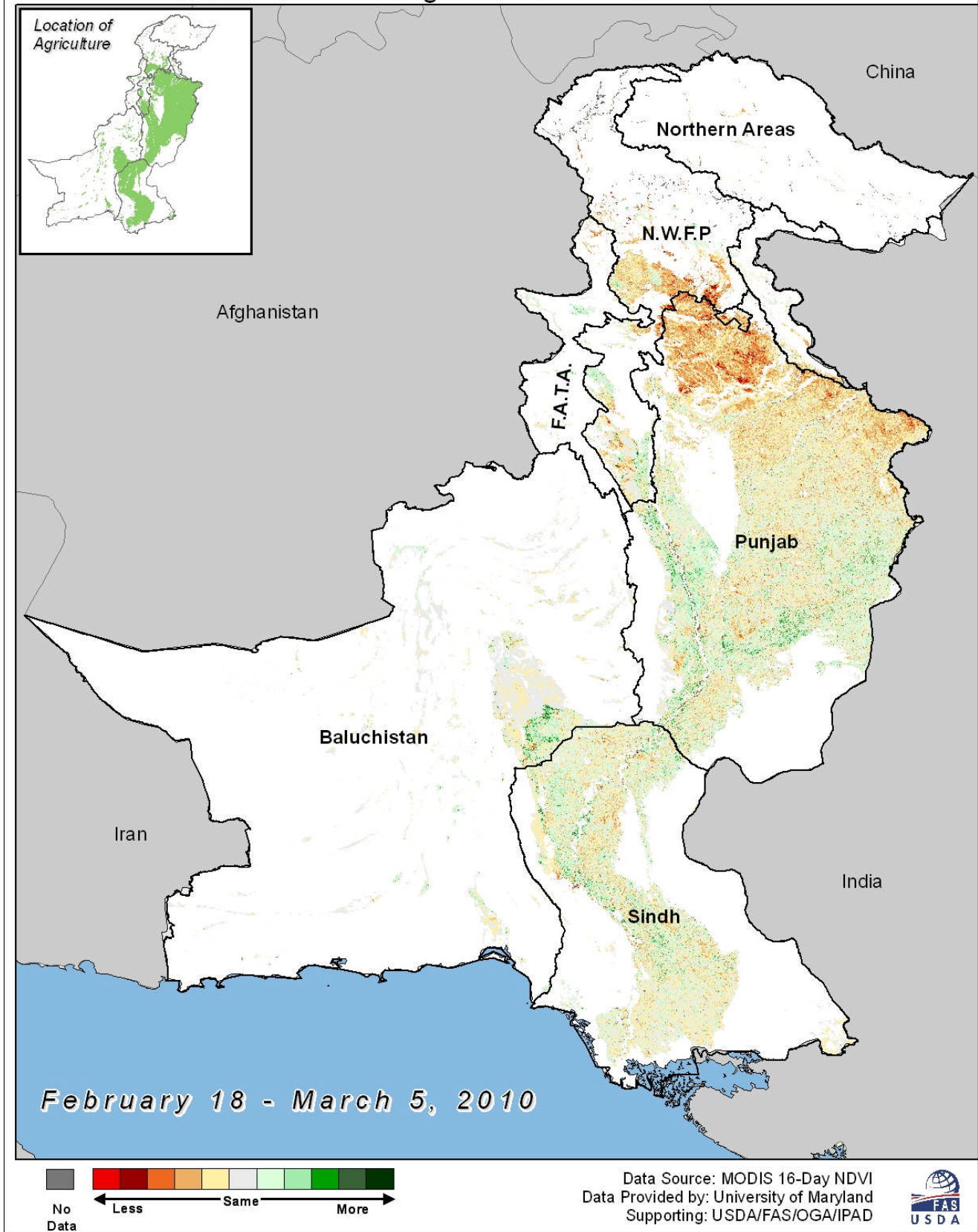


Figure 11. Rate of MODIS NDVI development in February compared to January, 2010. *Data Source: MODIS 16-Day NDVI*



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MODIS NDVI Change: MY 2010/11 vs. 6 Year Mean



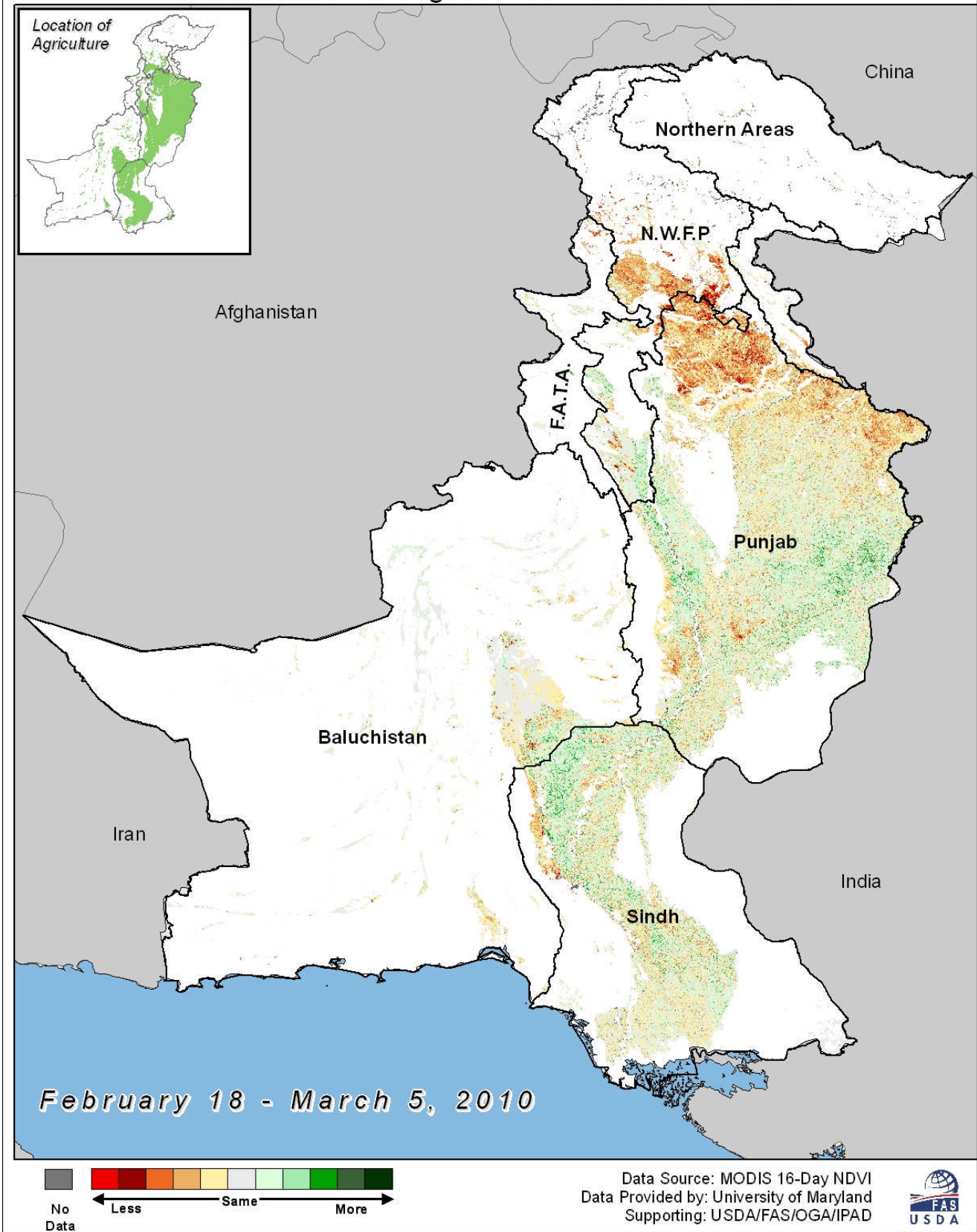
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Figure 12. MODIS NDVI 6-yr anomaly, February 18 – March 5, 2010. *Data Source: MODIS 16-Day NDVI*

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MODIS NDVI Change: MY 2010/11 vs. MY 2009/10



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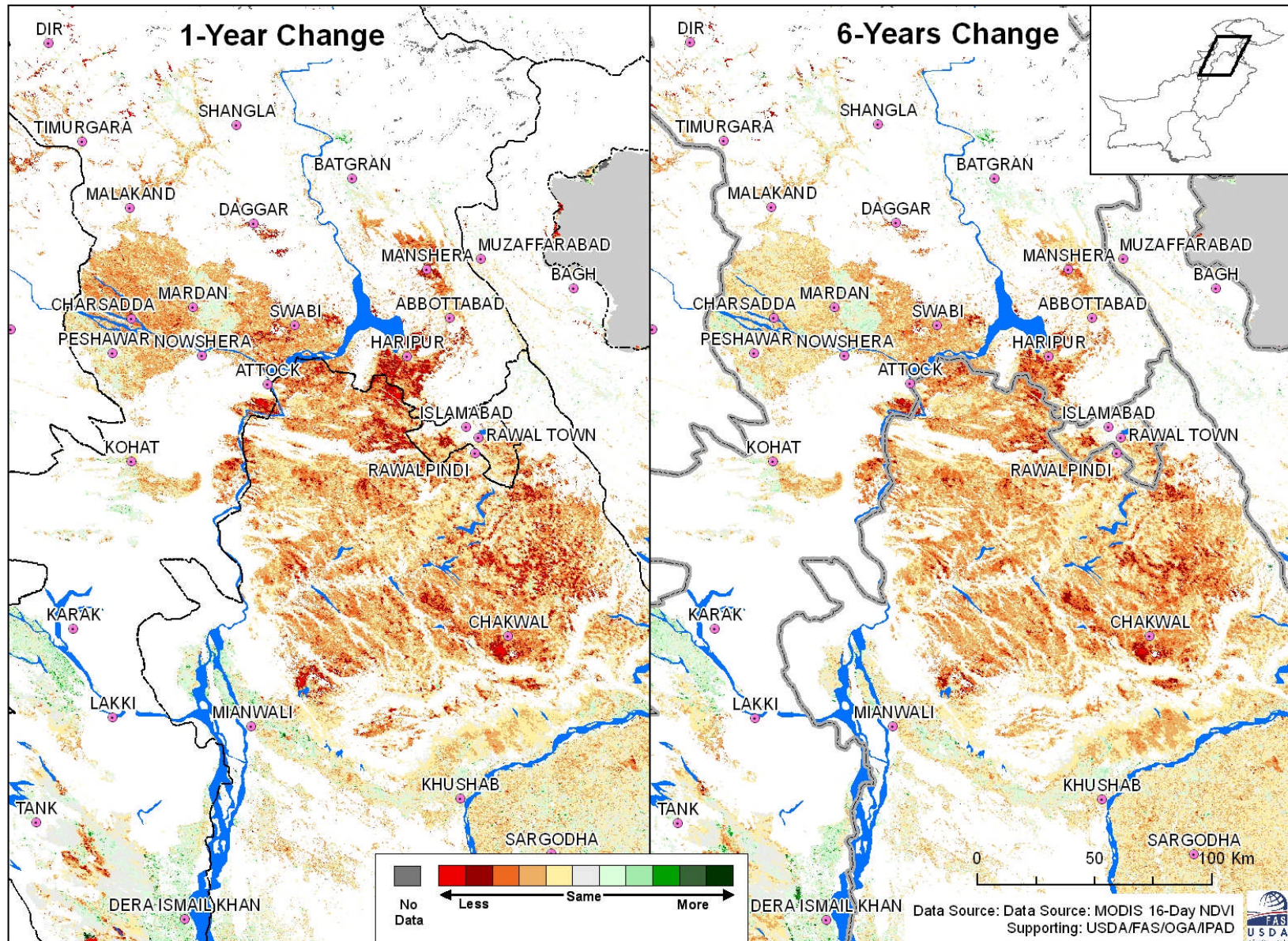
Figure 13. MODIS NDVI 1-yr anomaly, February 18 – March 5, 2010. *Data Source: MODIS 16-Day NDVI*

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**MODIS NDVI 1-yr and 6-yr anomaly variations in rainfed wheat areas, February 18 - March 5, 2010**



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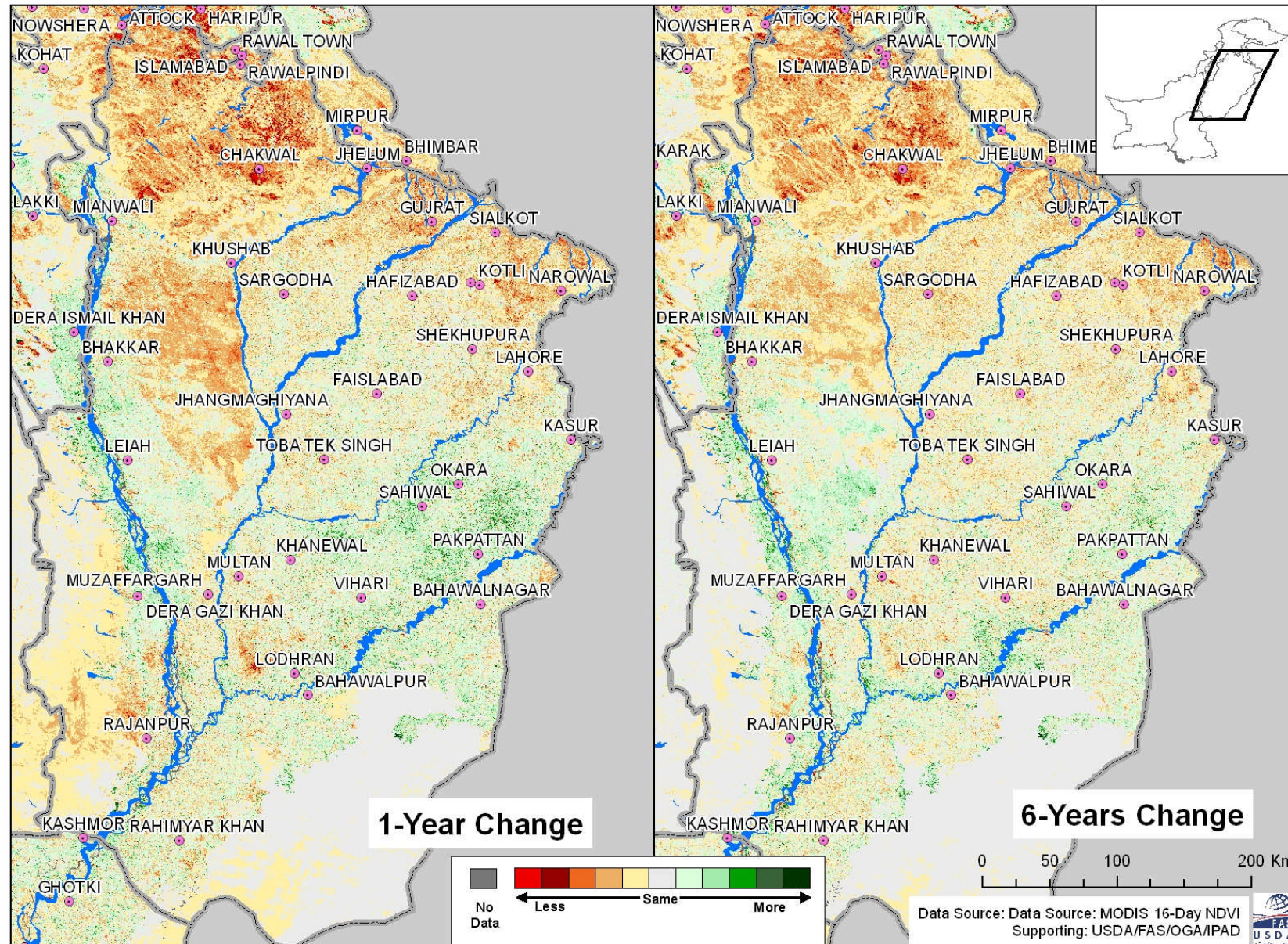
Figure 14. Change in MODIS NDVI for rainfed wheat area: MY 2010/11 vs. last year and 6-year average, February 18 – March 5, 2010. *Data Source: MODIS NDVI*

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**MODIS NDVI 1-yr and 6-yr anomaly local variations in Punjab, February 18 - March 5, 2010**



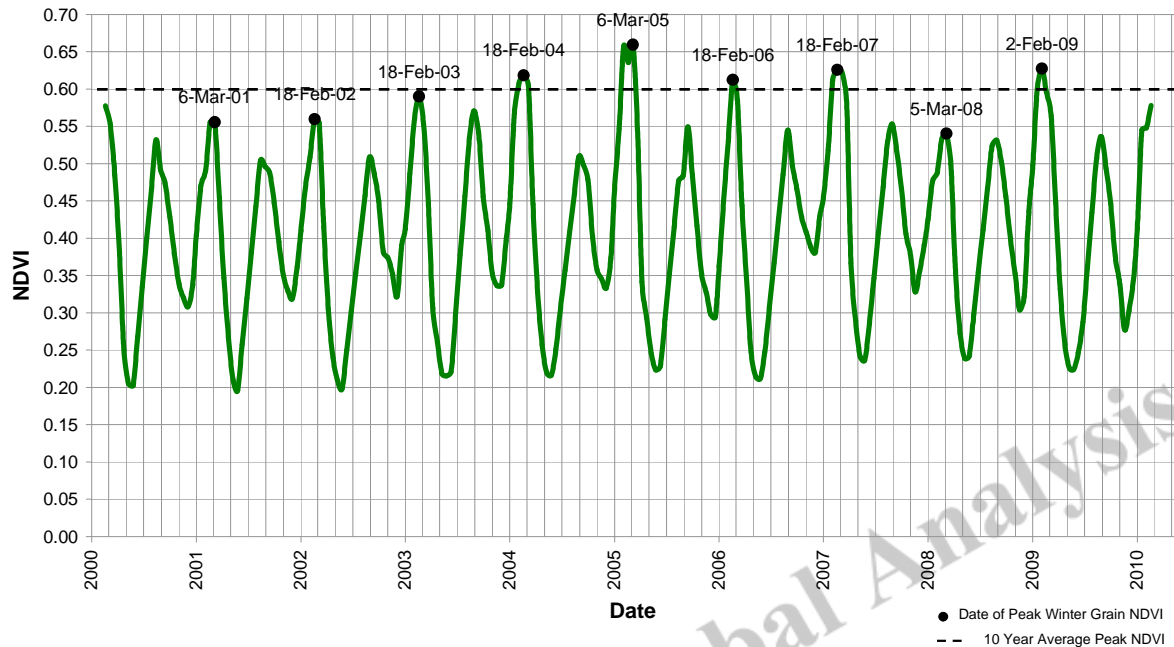
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Figure 15. Change in MODIS NDVI for irrigated wheat area: MY 2010/11 vs. last year and 6-year average, February 18 – March 5, 2010. *Data Source: MODIS NDVI*

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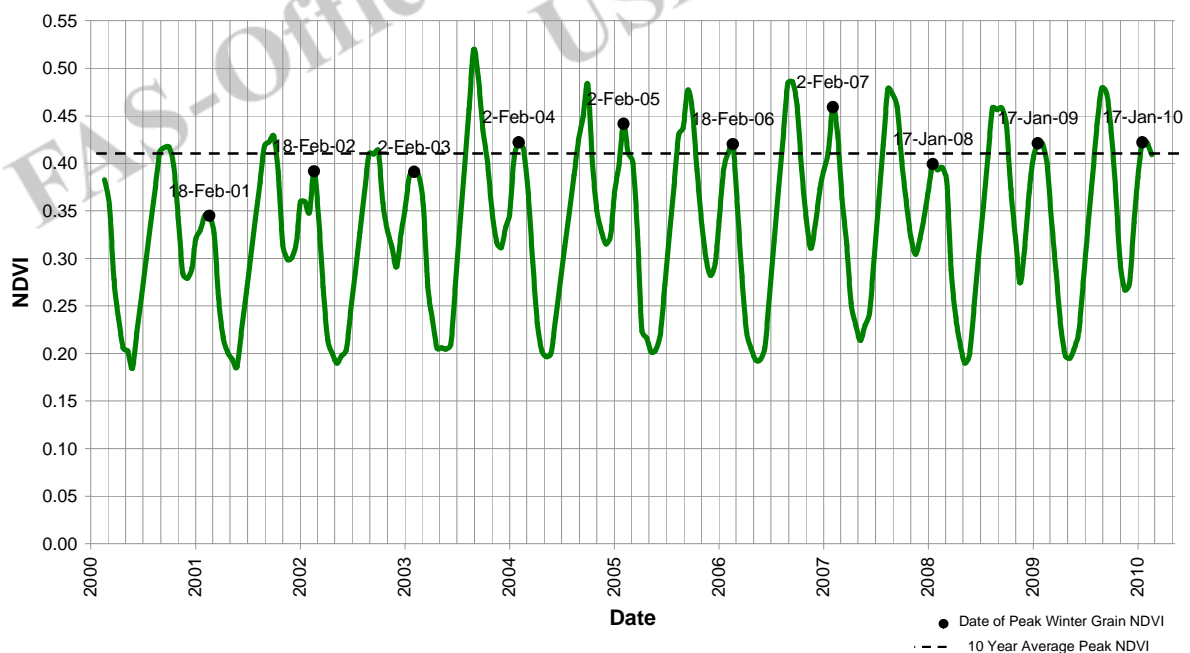
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### Punjab Agriculture NDVI Time Series



Punjab produces almost 77% of all wheat.

### Sindh Agriculture NDVI Time Series

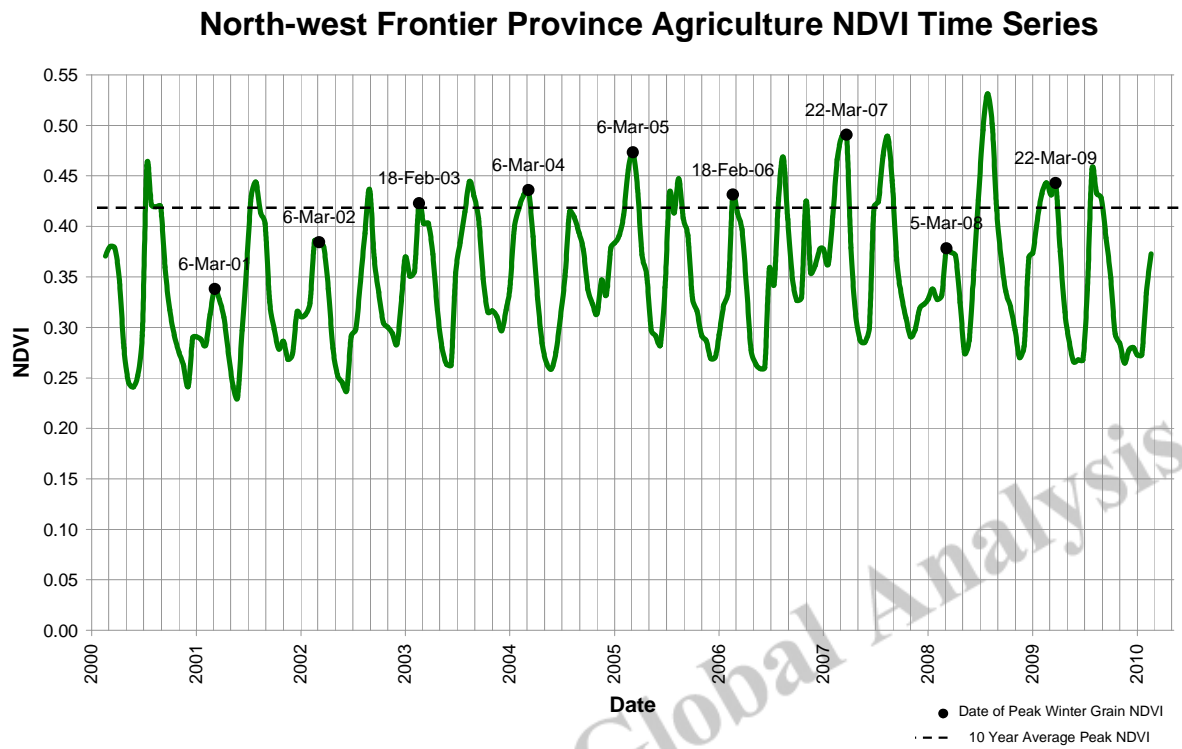




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Sindh produces almost 15% of all wheat

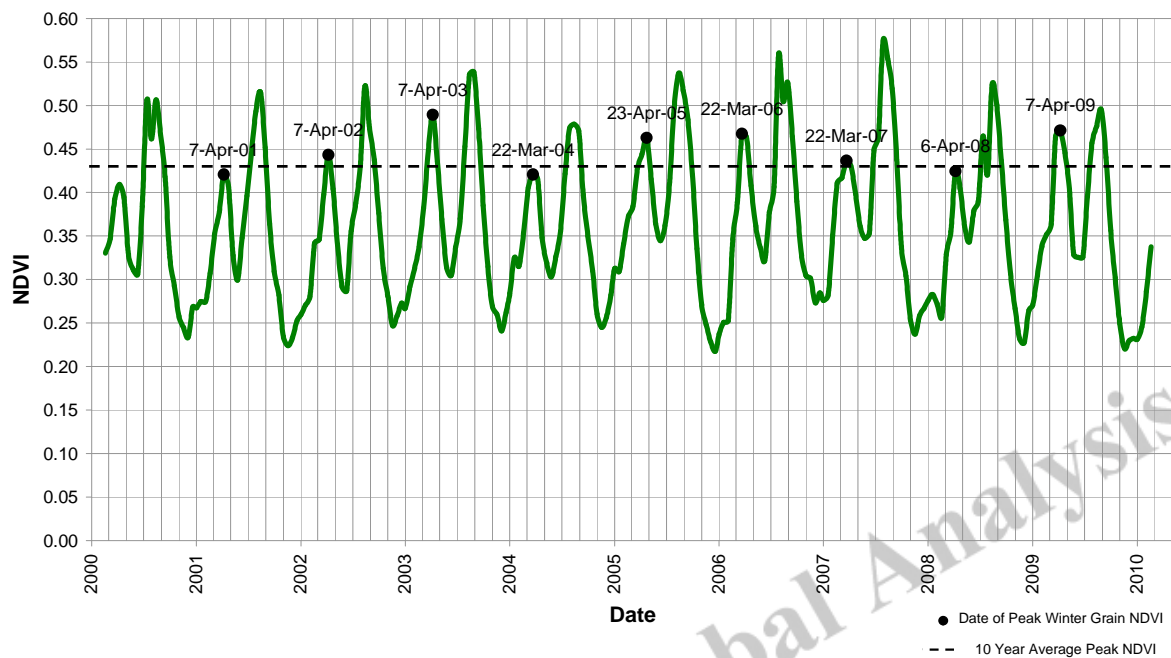
Figure 16. NDVI time series over Punjab and Sindh Provinces, Pakistan.





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### F.A.T.A. Agriculture NDVI Time Series

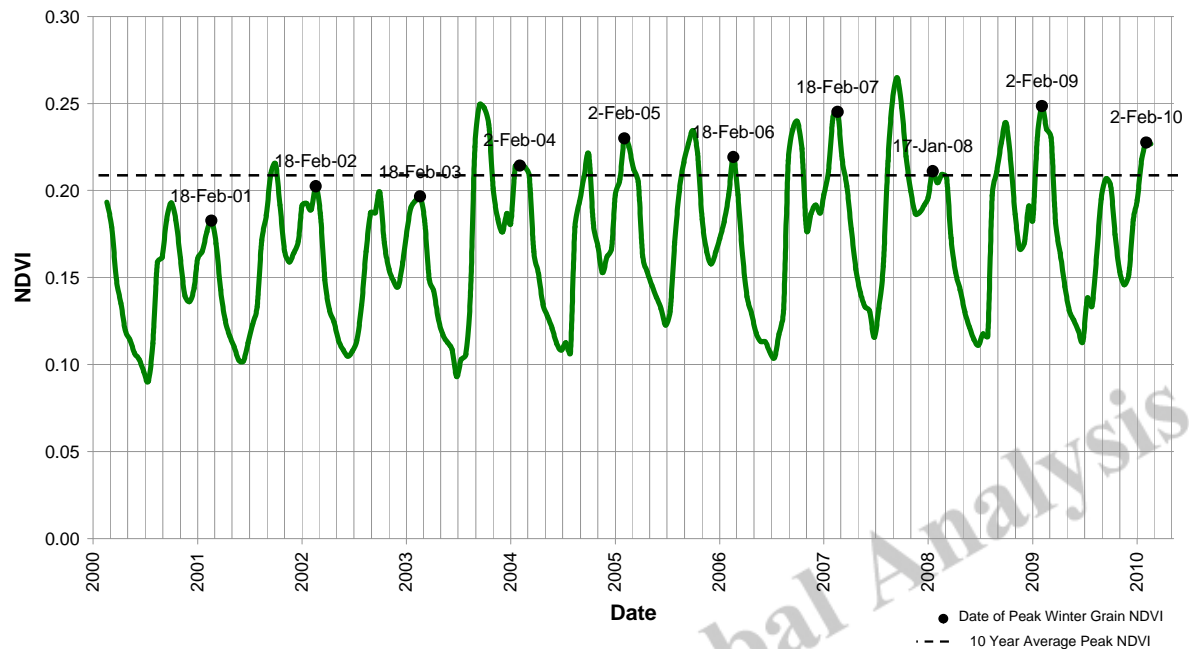


N.W.F.P. and F.A.T.A. produce 5% of all wheat

Figure 17. NDVI time series over N.W.F.P. and F.A.T.A. Provinces, Pakistan.

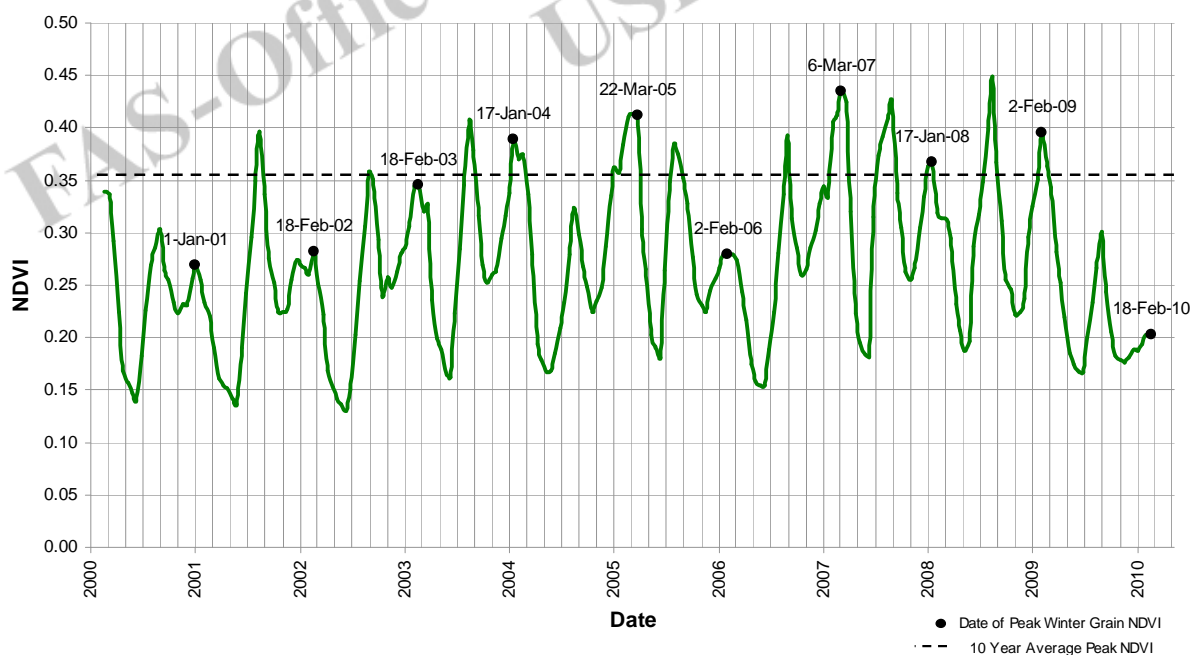
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### Baluchistan Agriculture NDVI Time Series



Baluchistan Province produces less than 4% of all wheat

### Rainfed Crop NDVI Time Series, 2000-2010



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Rainfed cropland, northern Punjab (see area map on Figure 6)
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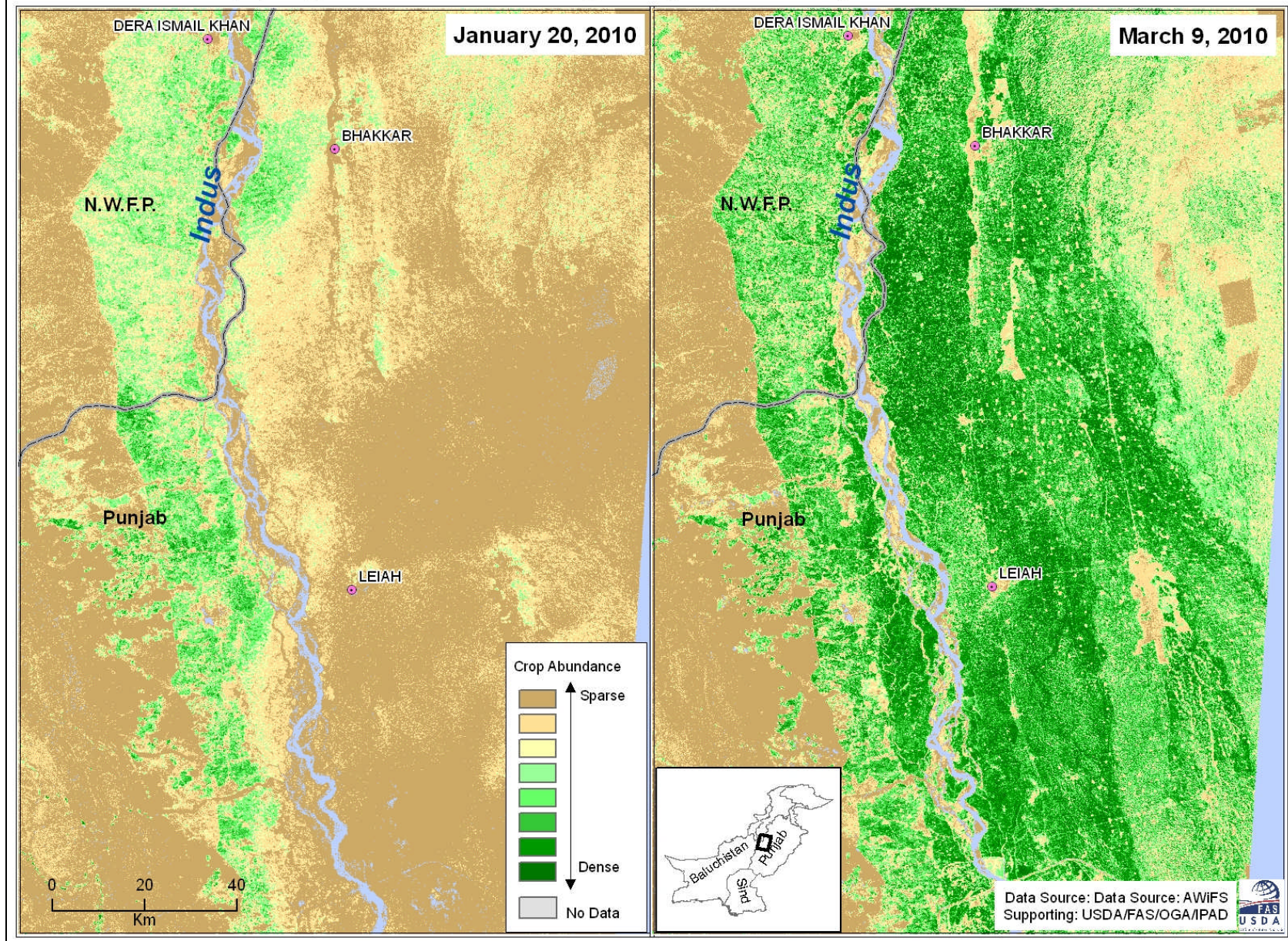
Figure 18. NDVI time series over Baluchistan Province and rainfed cropland in northern Punjab, Pakistan.

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Crop progress in Indus Valley, Punjab, January - March, 2010





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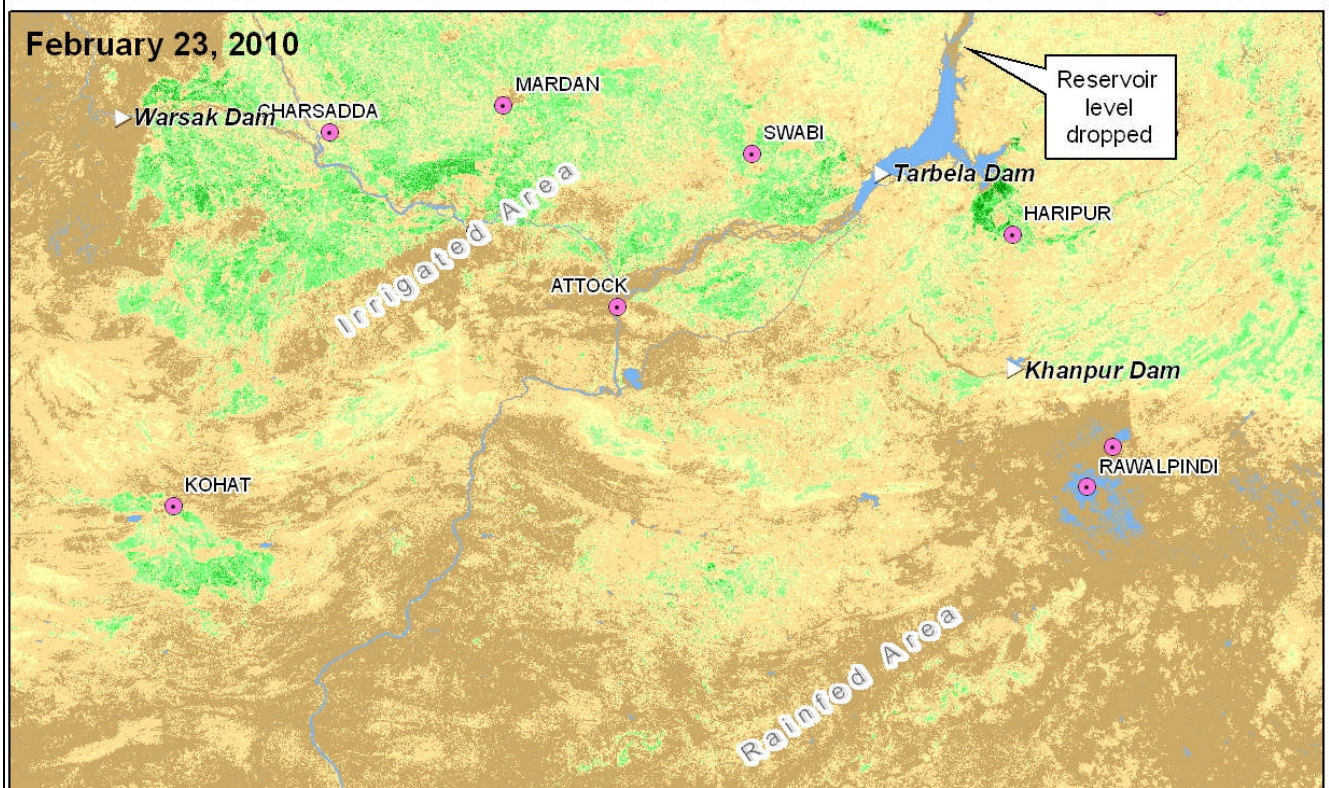
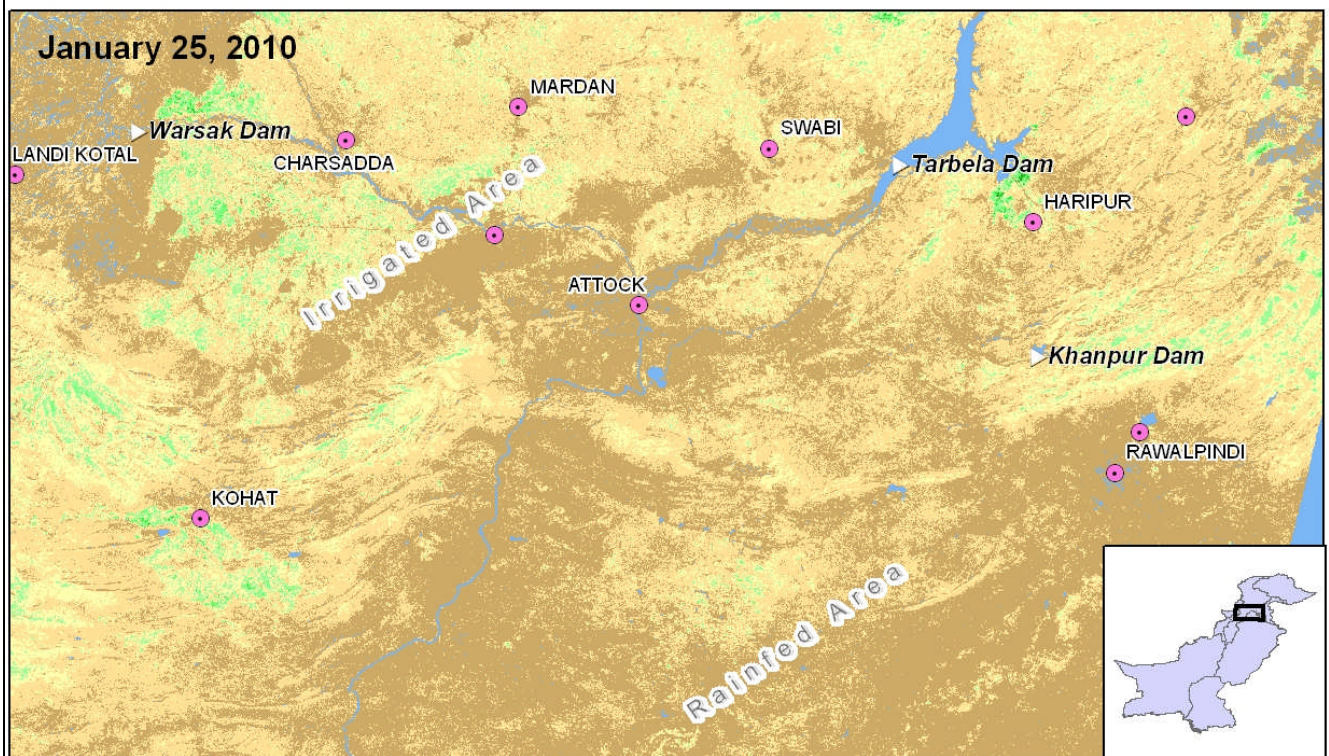
Figure 19. Crop progress in Indus Valley, Punjab, January - March, 2010. *Data Source: AWiFS*

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**NDVI Progress in Rainfed and Irrigated Wheat Areas, January 25 - February 23, 2010**



**Crop Abundance**



0 10 20 40  
Kilometers

Data Source: AWiFS;  
 Pakistan Ministry of Food, Agriculture and Livestock  
 USDA-FAS, Office of Global Analysis - IPAD  
 Crop Explorer





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Figure 20. Limited crop progress in northern Punjab – N.W.F.P., January 25 - February 23, 2010. *Data Source: AWiFS NDVI.*

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**Tarbela Reservoir Seasonal Status, 2010 and 2009**

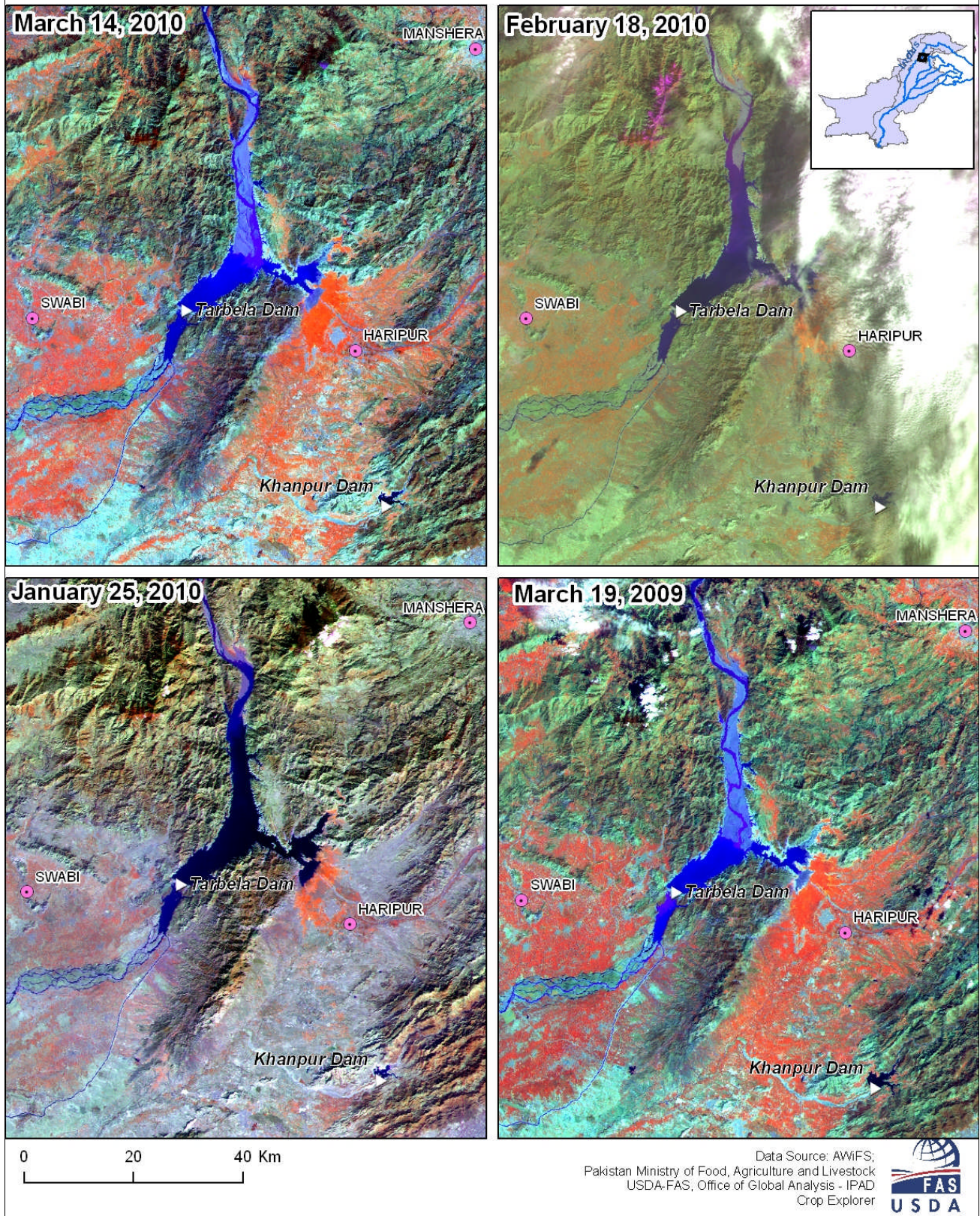


Figure 21. Tarbela reservoir seasonal status, January 25 – March 14, 2010 and March, 2009. *Data Source: AWIFS*



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## Winter Crops at Peak Development Stage in Okara District, Punjab

QuickBird false color image, March 5, 2010.



Variety of patchy agricultural landscapes represents seemingly uniform lush green crops as they appear on remote sensing imagery data

Data Source: QuickBird  
Photographs from GoogleEarth  
Office of Global Analysis - IPAD  
Crop Explorer





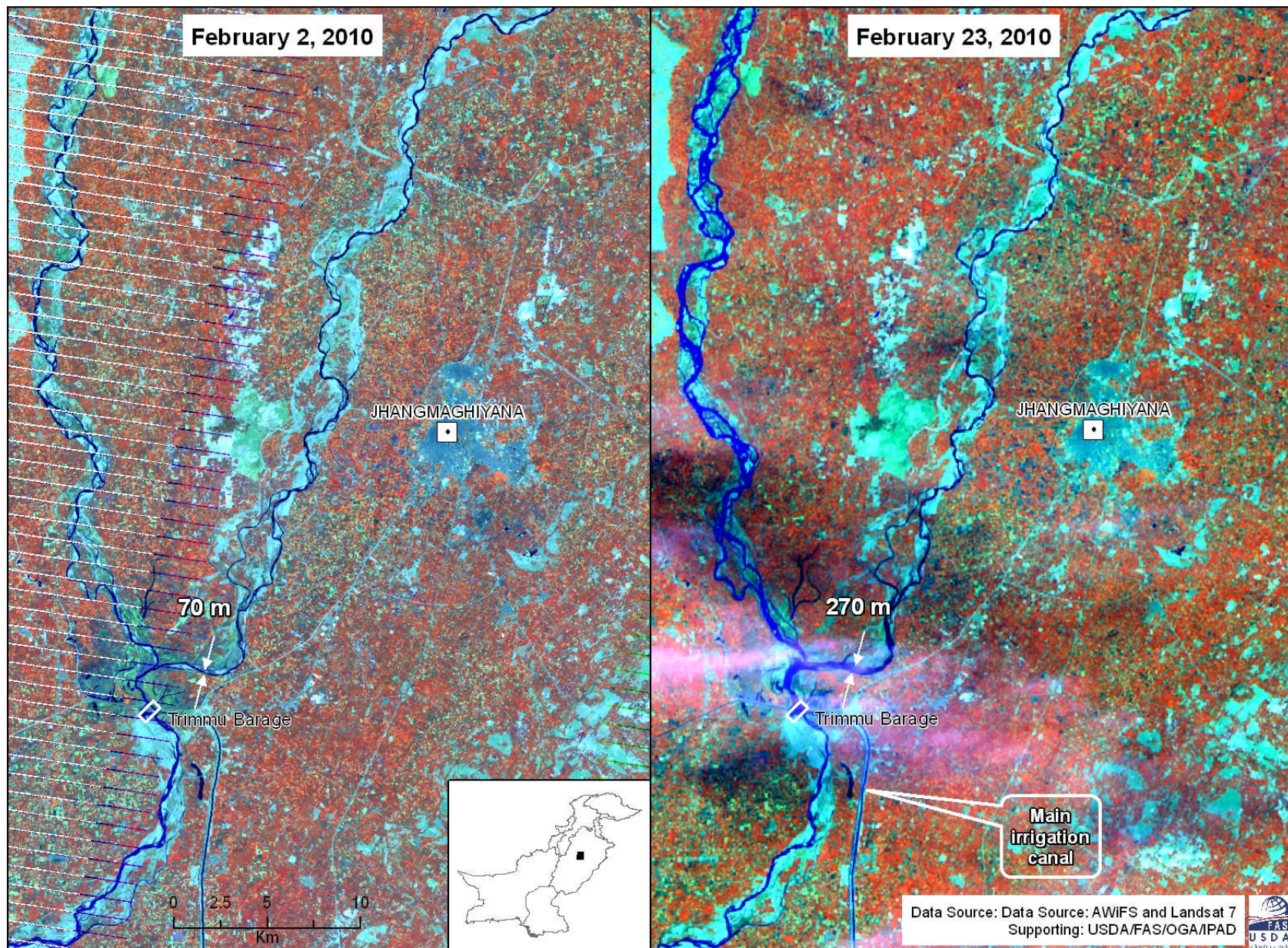
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Figure 22. Winter crops at peak development stage and variety of Punjab agricultural landscapes. *Data Source: QuickBird*

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## Irrigation Systems near Chenab and Jhelum Rivers Confluence, Punjab, February 2 - 23, 2010





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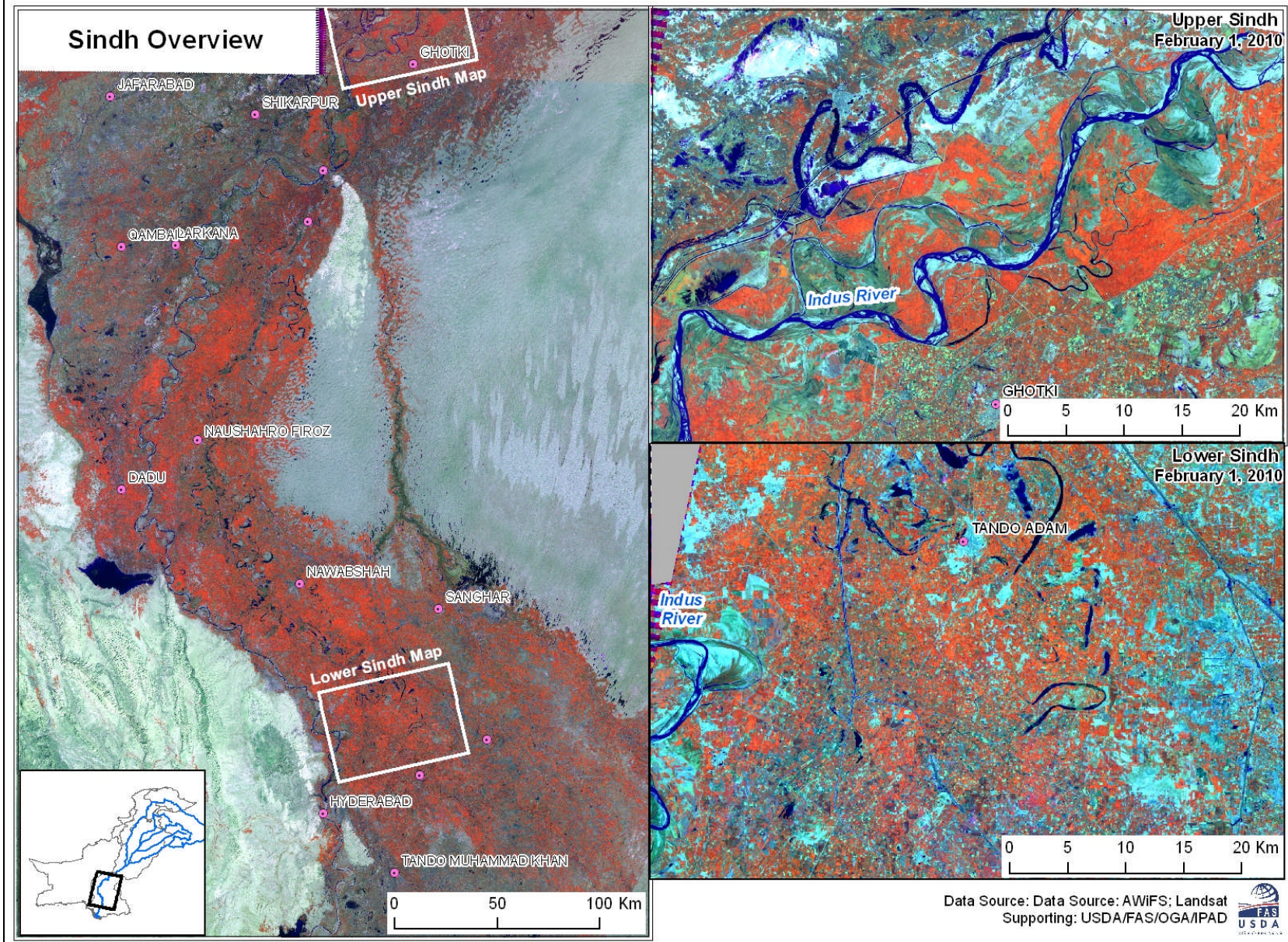
Figure 23. Increased mid-season flow provided more water withdrawal at Trimmu barrage, central Punjab, February, 2010. *Data Source: Landsat AWiFS.*

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Crop and water resources conditions in Lower Indus Valley, Sindh, January 25 - February 1, 2010



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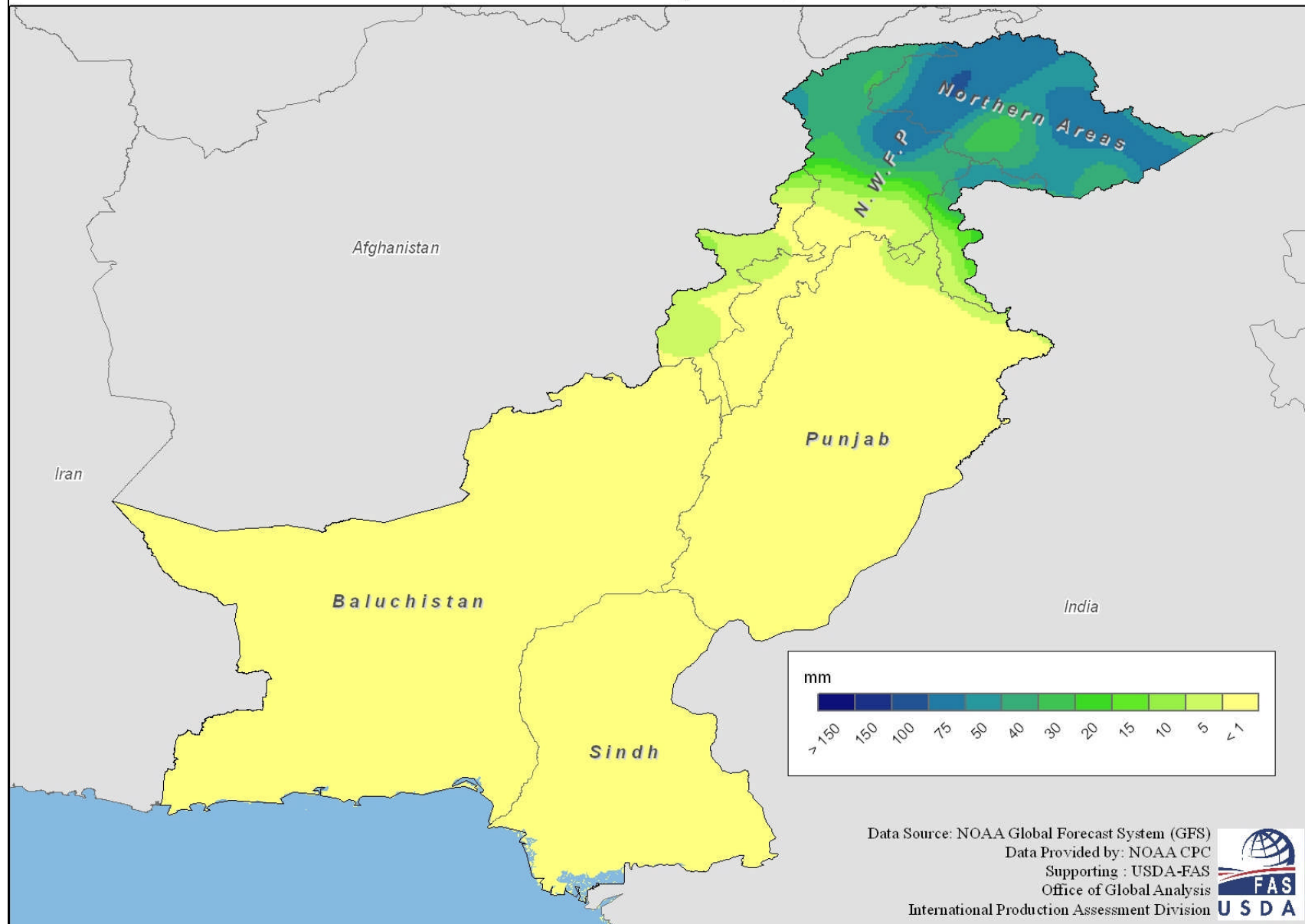
Figure 24. Crop progress in Lower Indus Valley and Indus River water level decline in early February, 2010. *Data Source: AWiFS*

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## 7-Day Precipitation Outlook over Agricultural Lands: March 29 - April 4, 2010



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Figure 25. 7-Day Precipitation Outlook over Agricultural Lands: February 24 - March 3, 2010. *Data Source: NOAA CPC*

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## APPENDIX

### Pakistan Crop Calendar

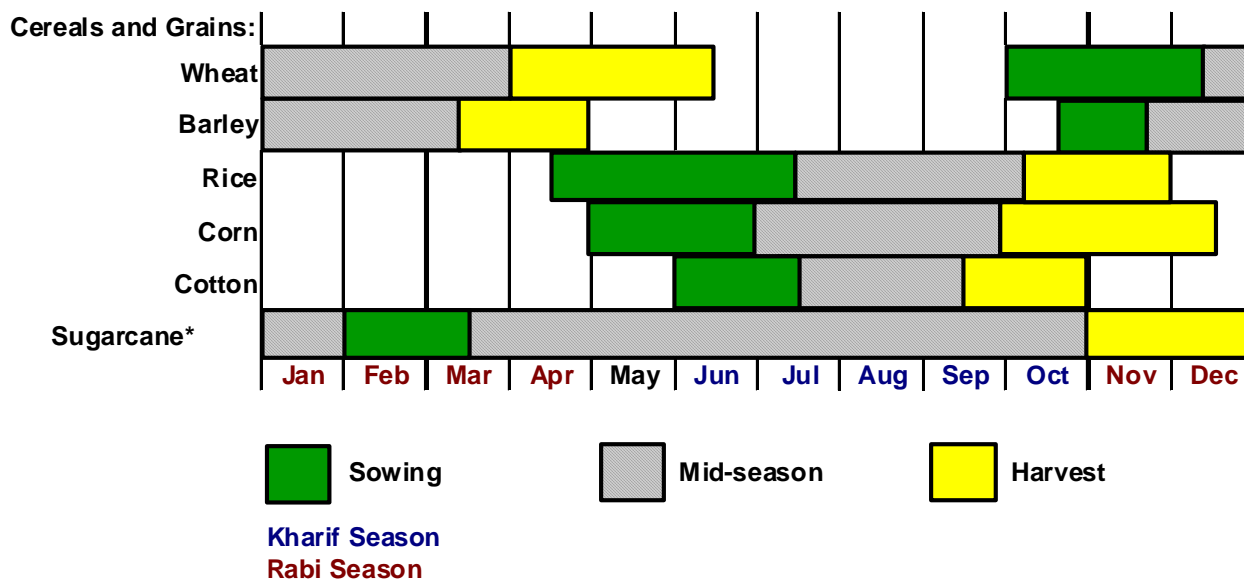


Figure A1. Pakistan crop calendar highlighting major crops grown during Rabi (Nov. – Apr.) and Kharif (June – Oct.) growing seasons. Calendar represents major production regions, timing of planting and harvest may vary regionally.

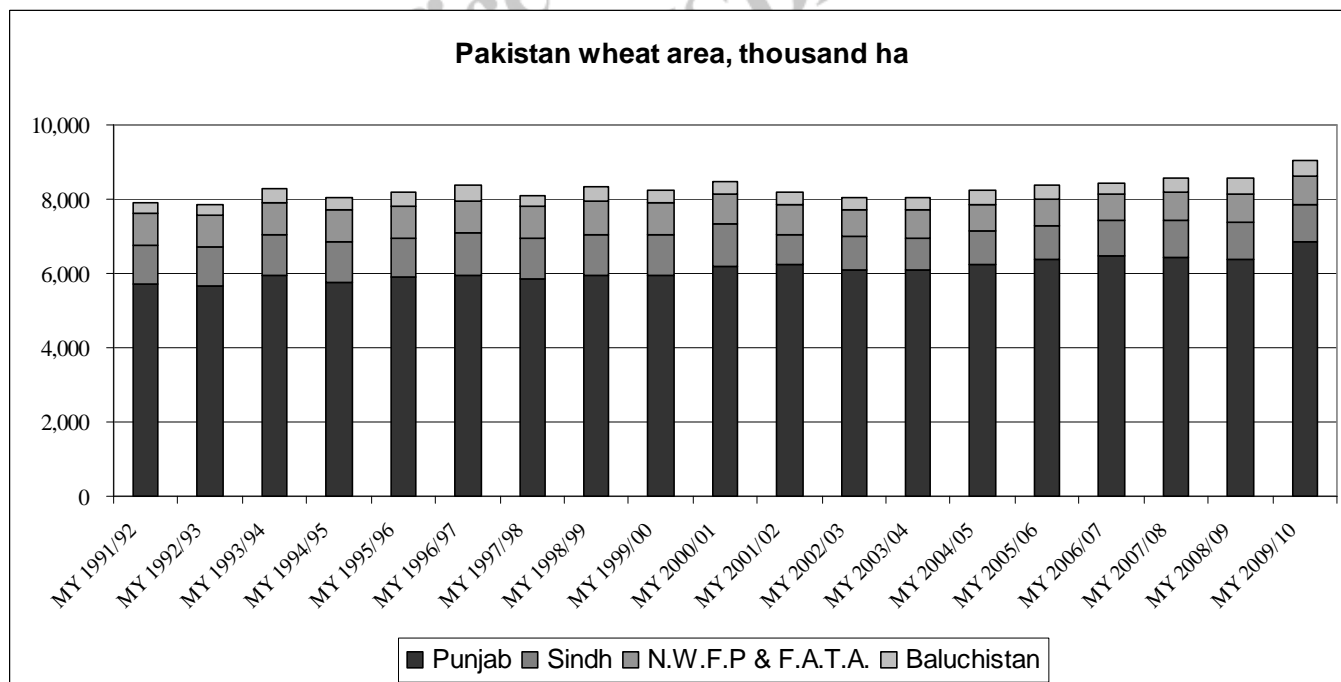


Figure A2. Pakistan wheat area dynamics, 1991 – 2009. Data Source: USA Office of Agricultural Affairs, Islamabad, Pakistan.

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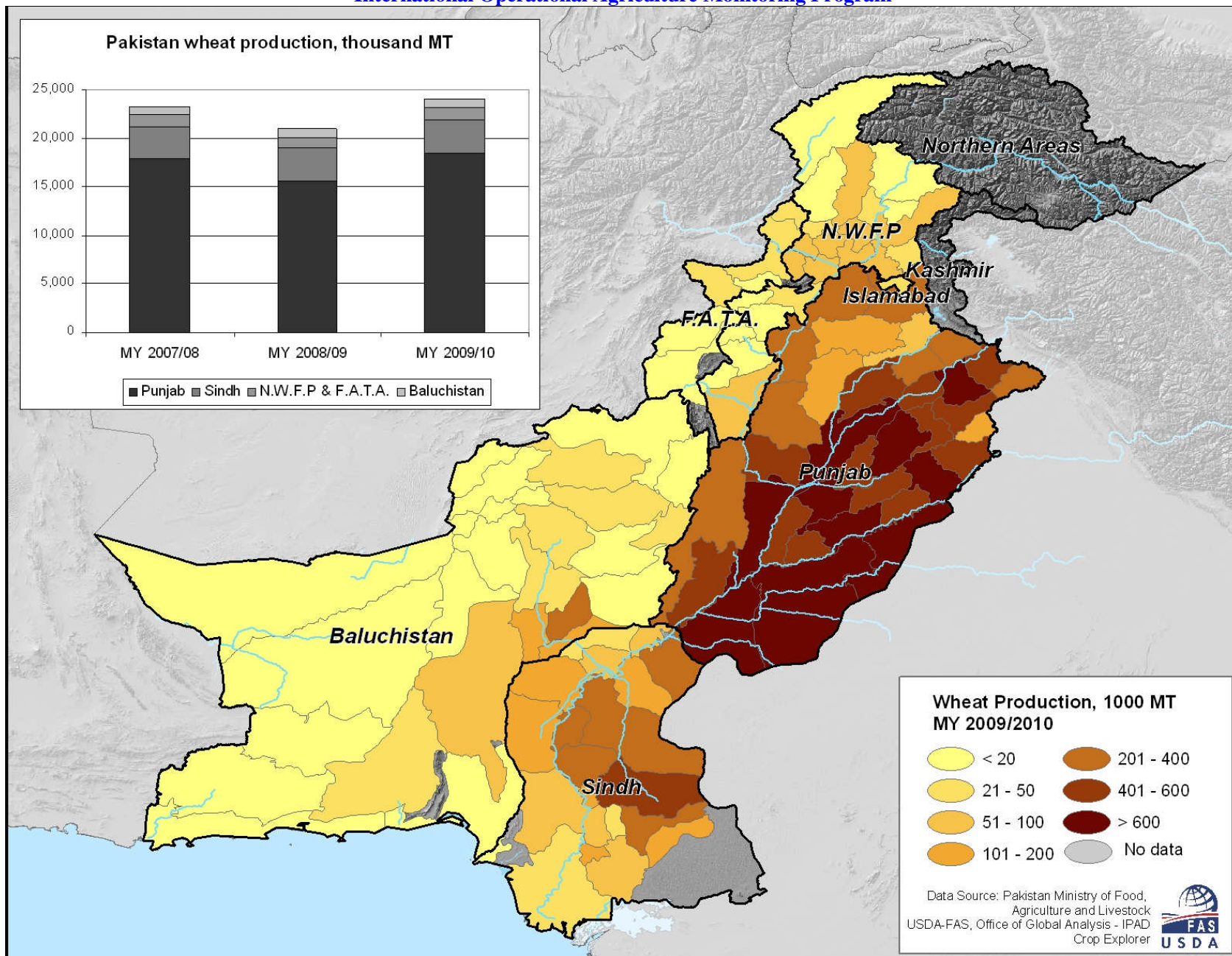
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Table A1. Pakistan area and production of wheat crop, 2007 – 2009 (calendar years).

*Data Source: Pakistan Ministry of Food, Agriculture and Livestock.*

			2006-07			2007-08			2008-09
Production, 1,000 MT	Irrigated	Rainfed	Total	Irrigated	Rainfed	Total	Irrigated	Rainfed	Total
<b>Pakistan, all</b>	<b>21,390</b>	<b>1,905</b>	<b>23,295</b>	<b>19,634</b>	<b>1,325</b>	<b>20,959</b>	<b>22,411</b>	<b>1,622</b>	<b>24,033</b>
Punjab	16607.5	1245.5	17853.0	14812.4	794.6	15607.0	17406.06	1013.94	18420.00
Sindh	3331.6	77.6	3409.2	3382.5	28.9	3411.4	3508.08	32.10	3540.18
NWFP & FATA	633.8	526.6	1160.4	634.4	437.4	1071.8	689.80	514.69	1204.49
Baluchistan	816.7	55.4	872.1	804.9	63.7	868.6	806.63	61.58	868.21
Top10 Rainfed Districts	827	1,225	2,053	828	800	1,628	866	1,051	1,694
Top 10 Irrigated Districts	8,279	61	8,340	7,094	52	7,146	8,490	48	8,537
<b>Area, 1,000 ha</b>	<b>Irrigated</b>	<b>Rainfed</b>	<b>Total</b>	<b>Irrigated</b>	<b>Rainfed</b>	<b>Total</b>	<b>Irrigated</b>	<b>Rainfed</b>	<b>Total</b>
<b>Pakistan, all</b>	<b>7,335</b>	<b>1,244</b>	<b>8,578</b>	<b>7,370</b>	<b>1,180</b>	<b>8,550</b>	<b>7,821</b>	<b>1,225</b>	<b>9,046</b>
Punjab	5723.0	709.8	6432.8	5742.4	659.6	6402.0	6144.23	692.00	6836.23
Sindh	937.0	45.2	982.2	951.3	38.6	989.9	990.53	40.88	1031.41
NWFP & FATA	314.0	440.3	754.3	322.4	425.0	747.4	331.40	438.11	769.51
Baluchistan	360.6	48.3	408.9	354.1	56.4	410.5	355.00	54.05	408.93
Top10 Rainfed Districts	340	701	1,041	372	650	1,022	383	688	1,071
Top 10 Irrigated Districts	2,718	32	2,750	2,667	34	2,701	2,885	48	2,933

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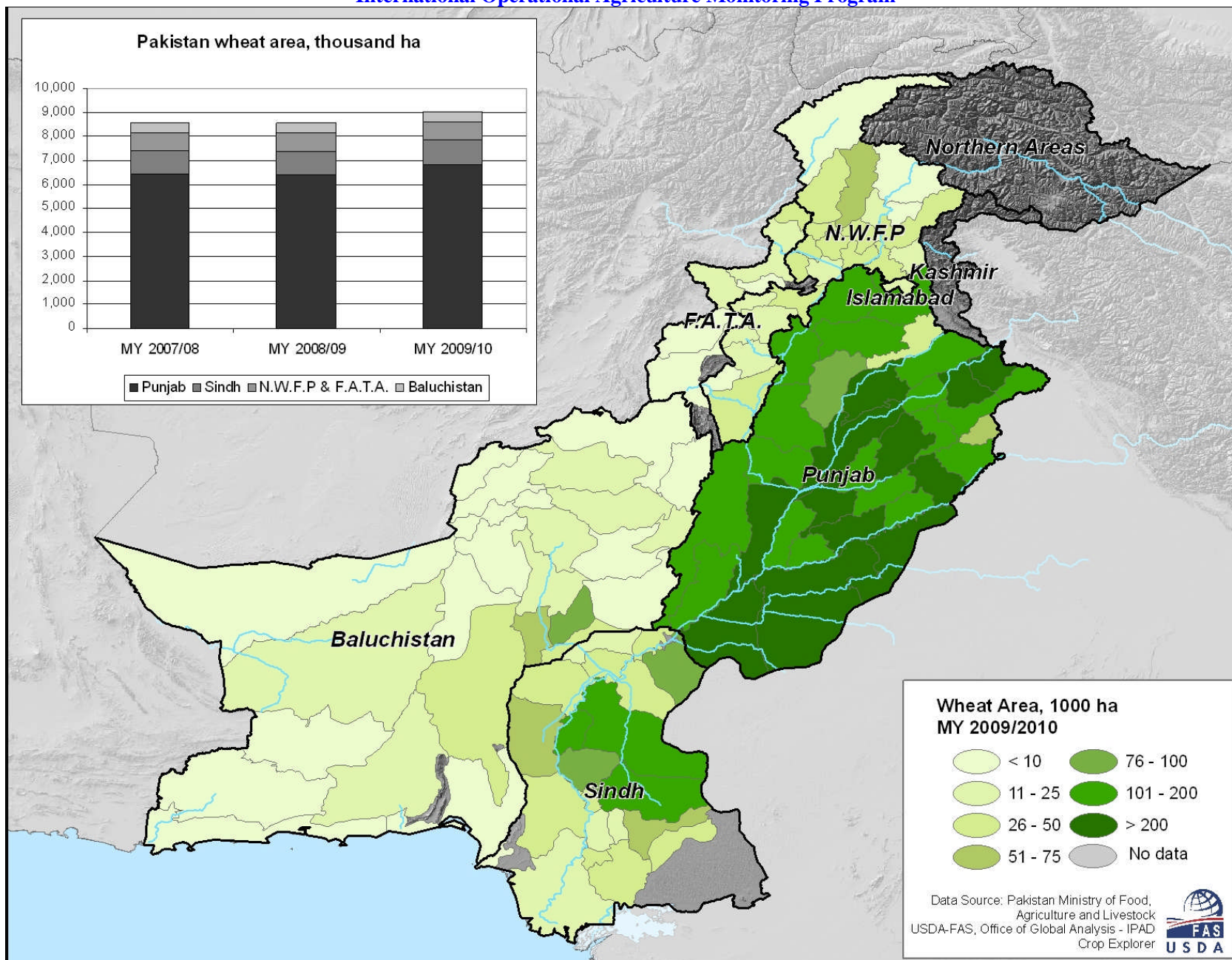


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Figure A3. Provincial and district-wise distribution of wheat production in Pakistan in MY 2007 – 2010.

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Figure A4. Provincial and district-wise distribution of winter wheat area in Pakistan in MY 2007 – 2010.

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